THE

JOURNAL OF AGRICULTURE.

JULY 1849—MARCH 1851.

NEW SERIES.

WILLIAM BLACKWOOD & SONS, EDINBURGH,
AND 37 PATERNOSTER ROW, LONDON.
MDCCCLI.

CONTENTS.

THE

JOURNAL OF AGRICULTURE.

SCOTTISH AGRICULTURAL RESOURCES, AND THEIR NEGLECT, IN THE WESTERN HEMISPHERE.

"Nothing can compensate a people for a dependence upon others for the bread they eat."—*Speech of Mr Van Buren, President of the United States of America,* 1839.

THE county of Mid-Lothian is in one sense, but a long overlooked one, the largest county on the face of the globe. The palatinate of Durham includes various nooks and corners, which are detached from it by intervening territory. Cromarty is bounded by two seas, having a goodly bulk of mountain and plain between, which owns another name. Similar geographical anomalies prevail as regards other districts and divisions in the United Kingdom. But for the metropolitan county of Scotland is reserved the boast, that it embraces an ocean within its limits, and possesses an outlying domain spacious enough to make a hundred and sixty separate shires as large as itself.

Poll Scotland from the Mull of Galloway to John o'Groats, and we question if five hundred men will be found able to tell where this *braid* appendage to Mid-Lothian is situate. In times, however, such as these, of free trade, of financial reform, and of population redundancy, *common-weal* concerns, new and old, will successively arise, imperiously to demand the general regard. Nationality of sentiment, long dormant, will again perforce predominate. The links of Scottish social life, of feudal attachments, will be resoldered; and great questions of household benefit, of universal aggrandisement, will concentrate attention. The Meneniuses of the nineteenth century will not altogether labour in vain to convince the state that agriculture is to the body politic what the belly was to the mutinous members. Nor will the doctrine prevail that "man lives by bread alone." And certainly the movements of the power-loom school will not be wholly unblest, should they have the effect of stimulating each rank and condition of men

to attend more fully to their own special interests. It is the individual wellbeing of classes that make up the sum-total of aggregate public wealth. To the improvidence of classes is to be attributed those enormous evils in population condition which form the master difficulty of the age in which we live. A practical disregard of the golden rule, "Each aid the others," has led, within the last eighteen months, to all the revolutionary convulsions which we have witnessed in Europe. Of late, this conflagration of a neighbour's house has diverted attention from the smouldering embers which are consuming the foundations of our own. But let us now take heed. At this moment the British nation is engaged in as stern a social conflict as that which overthrew the throne and the aristocracy two centuries back. Only, hitherto, the printing-press, the platform, the hustings, the floor of St Stephen's, have been the battle-field—and tongue, type, ink, paper, the weapons of warfare. What will be the issue of this contest of opinion—of this struggle, this jostle, this war for common subsistence—is what no man living can tell. But each and every man is responsible for that issue, and woe be to all should it not prove a happy one!

But to return to our narrative, and to bring these general remarks to bear on specialties:—The magnificent extra-Edinburghshire to which we refer, was situate, at the period of its annexation, in what was regarded as a *terra incognita*, lying across an expanse of waters which appeared illimitable. But now, through the marvels of steam-power, this distant country has come to be within an eight-days' sail of our shores—in other words, one-half of the average length of a voyage between Leith and London under the old smack-intercourse system. Though decried by many as a region of frost and snow, it is nearer to the torrid zone than Edinburgh castle by some eight hundred miles. It is the great coal and iron field of the continent of which it forms part. The climate is most salubrious, and adapted for European constitutions. The soil is of many different qualities, and various degrees of fertility. All the vegetables, fruits, crops, and roots of the British isles grow in abundance and perfection. The fisheries for cod, salmon, herring, mackerel, &c., are most productive and valuable. The French, when they occupied a corner of it, reckoned the fisheries a more certain and lucrative source of wealth than the gold mines of Peru. The country abounds in timber suitable for all domestic and other purposes. It is abundantly watered with lakes, rivers, and gulfs; and, from locality and resources, it must ever be a favourite field for British labour, enterprise, and capital.

We have now on the table, whilst we write, the "Reports of the Central Board of Management of the fund raised in 1847 for the relief of the destitute inhabitants of the Highlands and Islands of Scotland, [illegible] publications connected with the "Scheme of the

Colony of the Free Church at Otago in New Zealand," some twenty thousand miles distant, and a variety of documents bearing upon emigration and colonisation movements. But, as more immediately connected with the topic before us, we borrow from the writings of the talented member for Stafford the following remarks:—

Look at the map, and where on the face of the earth do we find anything compared with the portion of *New Scotland* in its ancient limits? Where do we find elsewhere throughout the globe anything like its harbours, its mines, its facility of transport, and whatever has furnished the richness of Britain; its fisheries, its navigation, its maritime greatness, its means of constructing ships, and of forming the men by which they are to be navigated? Nova Scotia, comprehending Cape Breton, New Brunswick, Prince Edward Island, Gaspé, are the very sources of maritime power —*it is there the Trident has sprung!* England has held that Trident only since she possessed them; and, when she loses them, it will have fallen from her grasp for ever, if it has not been already shattered in her hand. We stand, and have stood, in war invulnerable, not merely because we are an island, but because our island is constructed in a peculiar manner. It has the advantages of attack without being liable to the injuries of assault. We have harbours looking upon and threatening the shores of France and Germany, whilst they have no corresponding fortresses and keeps. Further, we are to windward and they are to leeward; we can send forth fleets to their coasts, favoured by the winds by which they are oppressed. This controlling power, possessed by England over the Continent, is exercised by North America over Europe. As England stands with respect to the coasts of the Northern Ocean and to France, so does Nova Scotia stand with respect to Europe and to England herself. Westerly winds blow during two-thirds of the year, and, from Nova Scotia's thousand harbours, fleets may reach the Mediterranean sooner than from Plymouth or the Downs. Look at this position, and then count the fortune we hold out to other powers the moment we are regardless of the value of our North American possessions. In these colonies reside manufacturing means equal to those that Great Britain enjoys. There is the same happy juxtaposition of iron and coal. There are fisheries equal and superior to those of England. There are to be found coasts and harbours, and extensive means of water communication, still greater than even the wonderful natural advantages of England can rival. There reside the maritime power which must command Europe, both by its timber and its naval position.

The noble country of *New Scotland* contains nearly all British North America now south of the river St Lawrence. It lies within the latitudes of 43° and 49° north, and the longitudes 58° and 68° west, and includes Nova Scotia (*proper*,) containing 9,995,880 acres; New Brunswick, 17,280,000; Gaspé, 4,722,960; Anticosti, 1,530,000; Prince Edward Island, 1,360,000; Cape Breton, 2,000,000—total, 36,888,840 acres; an area twice the size of the kingdom of Scotland. The land still vacant, and at the disposal of the crown, is considered to be—in Nova Scotia (*proper*,) 5,787,772 acres; in New Brunswick, 12,300,851; in Prince Edward Island and Cape Breton, 1,000,000 in Gaspé and Anticosti, 5,000,000—in all, 24,088,623 acres. From Valentia in the west of Ireland to Canseau in Nova Scotia, the distance is only 1650 statute miles, and the Honourable Admiral Owen states that the passage may be made in six days, or in six days and a half. The population of the British North American colonies, Canada included, reaches nearly two and a half million souls, about a fourth of the whole being south of the St Lawrence. The shipping employed between Great Britain and our North American colonies exceeds the aggregate foreign ship-

ping of Great Britain and the whole of Europe. Prior to the commencement of free trade, the total value of imports into these colonies was more than £4,000,000 annually, and their exports £3,000,000: the tonnage of exports to Great Britain alone being 600,000; of imports from Great Britain, 450,000.

To the first British monarch of the house of Stuart—James, the sixth of Scotland and first of England—belongs pre-eminently the title of the *Colonising King*. At the death of Queen Elizabeth in 1603, which was one hundred and ten years after the discovery by Columbus of the western hemisphere, neither the English, French, Dutch, nor any other nation excepting the Spanish, had made any permanent settlement in the New World. In North America, not a single European family could be found in the first and second years of the seventeenth century. About 1604, the French began to make settlements on the banks of the St Lawrence; and two years afterwards, the London Company and the Plymouth companies received patents from James for the settling of two plantations in what now forms the principal portion of the United States. The year 1609 is memorable for the commencement of those steps in Ulster by which, according to Hume and other historians, in "the brief space of nine years, he did more to tranquillise and settle Ireland than all his predecessors had accomplished during the four hundred and forty years that elapsed since her conquest was first attempted." Nor did he relax in this work until his death. First, in the spring of the year named, of "his princely bounty, not respecting his own profit, but the public peace and welfare of Ireland," he made known his determination to distribute the escheated domains in Ulster amongst such of his subjects (English, Scottish, and Irish) as should "seek the same with a mind not only to benefit themselves, but to do service to the crown and commonwealth." Next, in July following, he appointed a royal commission to proceed to Ulster to make surveys, divide the lands, fix sites of towns, and make reserves for churches, schools, and hospitals. Third, in the same year and month, he opened a negotiation with the lord-mayor and corporation of London to undertake the plantation, setting forth in separate articles those inducing reasons which led them to close with his majesty's offer. Fourth, he erected in 1611 the *hereditary order and dignity of Baronet*, "to establish that so great a province of the empire as Ulster should more and more flourish, not only in the true practice of religion, civil humanity, and probity of manners, but also in the affluence of riches, and the abundance of all things which contribute either to the ornament or to the happiness of the commonwealth." Fifth, he established the *Irish Society of London* in March 1613, to preside over the settlement and superintend the general affairs of the livery companies of London (fifty-five in number) having proprietary interests in the estates containing

818,344 acres in all. In 1615 we find his majesty causing a letter to be addressed to the lord-deputy of Ireland, strongly urging forward the progression of the plantation, and adding this remarkable postscript to it in his own handwriting:—"My lord, in this service I expect that zeal and uprightness from you, that you will spare no flesh, English or Scottish; for no private man's worth is able to counterbalance the particular safety of a kingdom, which this plantation, being well accomplished, will procure." Three years later, further to advance this royal work, the Irish branch of the baronetage was erected. "Such," says Hume, "were the arts by which James introduced humanity and justice among a people who had ever been buried in the most profound barbarism. Noble cares! much superior to the vain and criminal glory of conquest, but requiring ages of perseverance and attention to perfect what had been so happily begun." But King James' paternal cares in the colonisation cause did not stop with the success of which Ulster is to this day the standing monument. That province is, indeed, the only oasis in the still social desert of Ireland; and there is no exaggeration in the remark, that "it may now be said that the plantation of Ulster was an act of political wisdom, of more importance to Ireland, to Great Britain, and to Protestantism, than perhaps any other royal act in the history of our country." * His majesty, however, spent the closing years of his peaceful reign in grander plantation achievements than these. He renewed, in 1621, the name of his ancient native kingdom in the transatlantic world. He founded an hereditary *Vice-royalty* there. He annexed, united, and incorporated the lands, country, and lordship of Nova Scotia, to the crown and realm of Scotland, making seisin thereof, or of any part or portion thereof, "taken at the Castlehill of Edinburgh as the most eminent and principal place of the kingdom of Scotland," good and sufficient seisin in law. He vested the vice-royalty of this western Caledonia in a noble Scottish subject, whom he first created Viscount of Canada, and afterwards Earl of Stirling. In 1624 he divided *New Scotland* into two provinces, each province having several dioceses, and each diocese containing three counties, and each county ten baronies, every barony being three miles long upon the coast, and ten miles up into the interior, divided into six parishes, each parish containing six thousand acres of land. He announced to the privy council his intention to institute the *Baronetage of Scotland and Nova Scotia*, for the purpose of advancing the plantation; "every baronet to be a *baron* of some one or other of the said baronies, and to have therein 10,000 acres of property, besides his 6000 acres belonging to his burgh of barony." And, finally, from his deathbed, he acquainted the lords of his council of his desire that "they should assist the undertakers, being of the

* Rev. Dr Lang. See his speech on Colonisation, *British Banner, July* 1848.

ancientest gentry of Scotland, by all lawful means, and countenance the business by their authority." He assured them that "it did exceedingly content him that he had so happily found a means of expressing his affection towards his ancient kingdom, as what he found, by the consent of them all, was so much tending to the honour and profit thereof." And, speaking of the colony as one that was to be "the foundation of a great work, both for the good of the kingom in general, and for the particular interest of every baronet," he declared that, "as he had begun, so he would continue the enterprise, requiring them in like manner to *persevere* for the furtherance of this royal work, that it might be brought to *a full perfection*." The two letters from which these extracts are taken were respectively dated from the court at Teobald's on the 17th and the 23d of March 1625, and he died on the 27th of the same month. Honour, then, to the memory of James the Sixth! If ever a monarch died in a glorious cause with harness on his back, he was that man. Yes—centuries hence his name will stand bright in the annals of the New World, surrounded with the imperishable halo of being the founder of monarchical colonies there. And there, too, long after those slurs are forgotten which modern democratic scribes have invented to his dispraise, it will be remembered that his contemporaries bedewed his hearse with such tributes as this,—"To express his character in a word, which worthily might be matter for many volumes, he was to his wife a most loyal husband, to his children a most loving father, to his servants a most bountiful master, to his subjects a most just prince, to all princes near him a most peaceful neighbour. That more justly may be said of him than of whom it was said, '*Quæ te tam læta tulerunt sæcula?*' A prince after Plato's own heart for his learning; and, which is infinitely more worth, after God's own heart, for his religiousness and piety." *

Nor was this great colonisation enterprise in any measure arrested by the demise of James I. His plantation mantle descended upon his son and successor—the less happy Charles I., who zealously carried forward what his father began. On the 28th of May 1625 he created three baronets, viz.—The Honourable Sir Robert Gordon, second son of Alexander, eleventh earl of Sutherland; Sir Alexander Strachan, of Strachan, head of an ancient family; and Sir William Keith, Earl Marischal. These creations were followed by seven others, comprising the ancestors of the present Marquess of Breadalbane, the Duke of Roxburgh, the Earl of Wemyss, Lord Macdonald, the Earl of Mansfield, &c., until the 19th of July, on which day his majesty issued a commission under the great seal of Scotland, empowering a quorum of seven of the privy council to receive resignations from the heredi-

* Sir Richard Baker's Character of James I.

tary lieutenant of Nova Scotia, of the stipulated territorial qualification of 16,000 acres, in favour of such persons of chief quality as felt disposed to aid its plantation, and to give and grant to them new heritable infeftments of the said lands, together with the degree, state, order, dignity, name, honour, title, and style of *Baronet*, with suchlike privileges, prerogatives, immunities, liberties, and others whatsoever, which were granted in the charters already passed to the baronets of the kingdom of Scotland, made by his majesty in person. This commission authorised the privy council to create baronets until the number of one hundred and fifty was completed; and in a royal letter that accompanied it, Charles refers to preparations for setting forth a colony at the next spring. The records of the privy council, the statutes passed by the Scottish legislature, and contemporaneous history, show an unbroken progress in this colonisation work during Charles's reign, except from interruptions of an extraneous nature. Sir William Alexander, the eldest son of the hereditary lieutenant, went out in 1627 with a body of colonists, and took possession of Nova Scotia. Two years later a ribbon and badge was conferred on the baronets; and in the royal warrant for this distinction, Charles observes, "Our lieutenant of New Scotland, who these many years bypast hath been at great charges for the discovery thereof, hath now in end *settled a colonie* there, where his son Sir William is now resident." Sir James Balfour, one of the baronets, and Lord Lyon King of Arms, in his *Annals of Scotland*, anno 1630, mentions "about the end of February this year a *fleet of fourteen ships* sailed, furnished with men, women, and children, and all necessaries, divers of them being handicraftsmen of good quality and substance, to make a firm plantation in those parts of America called New Scotland, lying between the degrees of 42 and 48. They had with them two hundred and sixty kine, and other live cattle, for their use at their arrival." This same year, on the last day of July, the Scottish estates passed an act unanimously ratifying, allowing, approving, and confirming the *dignity and order of baronets*, with all rights and privileges, territorial and otherwise, vested in the institution, because they considered the plantation of Nova Scotia to be "a purpose highly concerning the sovereign's honour, and the good and credit of that his ancient kingdom." The year following, King Charles speaks, in a royal letter addressed to the Privy Council, dated 12th July, of "the sensible consideration and notice taken of the colony by neighbouring countries how well the work was begun, his lieutenant having fully performed what was expected from him for the benefit which was intended him by the creation of the baronets." From Beaulie, on the 15th of August 1632, his majesty addressed a special letter of exhortation to the baronets, in which, after adverting to the fact that "his late dear father, out of his royal care for the honour and weal of that his ancient king-

dom of Scotland, was pleased to annex to the crown thereof the dominion of New Scotland, in America, that *the use of it might arise to the benefit of Scotland*," he proceeds to remark:—

We, being desirous that the wished effects might follow by the continuance of so noble a design, were pleased to confer particular marks of our favour upon such as should voluntarily contribute to the furtherance of a plantation to be established in these bounds, as appeared by our erecting of that *Order of Baronets* wherewith you are dignified: whereunto we have ever since been willing to add what farther we conceived to be necessary for testifying our respect to those that are already interested, and for encouraging of them who shall hereafter interest themselves in the advancement of a work which we so really consider to be for the glory of God, and the honour of the nation, from the benefit that is likely to flow from the right prosecution of it. But in regard that, notwithstanding the care and diligence of our right trustie the Viscount of Stirling, whom we have from the beginning intrusted with the prosecution of this work, and of the great charges already bestowed upon it, hath not taken the root which was expected, partly, as we conceive, by reason of the incommodities ordinarily incident to all new and remote beginnings; and partly, as we are informed, by want of the timely concurrence of a sufficient number to assist in it; but especially, the colony being forced of late to remove for a time by means of a treatie we have had with France. Therefore, having taken it into our royal consideration by what means again may this work be established; and conceiving that there are none of our subjects whom it concerns so much in credit to be affectioned to the progress of it, as those of your number for justifying the grounds of our princely favour, which you have received by a most honourable and generous way, we have thought fit to direct the bearer hereof, Sir William Alexander, Knight,* unto you, who hath been an actor in the former proceedings, and hath seen the country, and knows the commodities thereof; who will communicate unto you such propositions as may best serve for making the right use hereafter of a plantation and trade in these bounds, for encouraging such as shall adventure therein. And we doubt not, but if you find the ground reasonable and fair, you will give your concurrence for the farther prosecution of them. And as we have already given order to our advocate for drawing such warrants to pass under our seals there, whereby our loving subjects may be freed from all misconstruction of our proceedings with the French anent New Scotland, and secured of our protection in time coming in their undertakings with it, so we will be ready to contribute what we shall hereafter find we may justly do for the advancement of the work, and the encouragement of all that join with them to that purpose. Which recommending unto your care, we bid you farewell.

King Charles, however, did not bid farewell to the cause by writing this memorable epistle. The year following he again enjoined upon the privy council his command, "that Viscount Stirling, with all such as should adventure with him, should prosecute the work, and be encouraged by all lawful helps thereunto, as well by completing the intended number of baronets as otherways." When in Scotland, also, the year following, his majesty in person, and the estates of the realm in parliament assembled, made and passed a statute act, ratifying the act of the convention of estates in 1630, whereby they approved of the dignity and order of baronet; and willing and ordaining that the said institution should stand and continue in force with all rights, liberties, &c., thereunto appertaining.

The letter above cited from King Charles to the baronets, was written ten years before the time when he erected his fatal stan-

* Viscount Stirling's eldest son, afterwards Viscount Canada. He predeceased his father, dying in 1638.

dard at Nottingham. Nor was the appeal which he made unresponded to. Within his lifetime about one hundred and twenty-three heads of ancient families, most of them being free barons, were raised to the hereditary dignity of *Baronet;* and, after the Restoration and down to the Union, the same title was conferred upon others, together "with all the privileges, liberties, immunities, and advantages thereunto belonging, and with no less liberty and *extent of right in all respects* as any other baronet of the kingdom of Scotland at whatsoever time past had obtained or enjoyed, and still possess and enjoy, or might at any future period obtain, possess, or enjoy." At the time we write, this noble order still enrols a hundred and fifty members, of whom above thirty have succeeded, or been raised to higher titles of honour. This body forms the *hereditary peerage* of New Scotland, each having right of seat and voice in the legislative assemblies of the province. Of the land granted with the titles conferred by Charles I., amounting, in the whole, to about 1,800,000 acres, most of it remains unlocated, whilst, to place the entire baronetage upon the territorial footing intended by the royal founder (and which would require two and a half million of acres in all) the crown has still vacant, and at its disposal in Novia Scotia, 24,088,623 acres.

In the preceding narrative we have traced the rise and progress of the colony, and the order instituted to advance its settlement, up to the breaking out of the great social wars. It would be tedious to dwell on the various events intervening between that sad landmark in history and the treaty of Paris in 1763, when Nova Scotia was finally restored to the British crown. It will suffice to say, that King William III. in 1698, that is to say, seventy-three years subsequent to the foundation of the order, formally recognised and confirmed the patent of the premier baronet—a document made by various instruments the *Magna Charta* of the Scottish baronetage—by passing a royal warrant for a charter of novodamus, on which, on the 27th of June in that year, infeftment was taken as authorised by former deeds at the Castlehill of Edinburgh, and duly recorded in the register of seisins. With this fact upon record, it cannot be pleaded that the rights of Scotland, and of Scottish subjects in North America, did not fall within the scope and fair view of that clause in the Act of Union in 1707, which provides that "no alteration shall be made in the laws which concern Scottish private rights." In 1709 there was a restitution by the French of the possessions of the Scottish crown, overrun by them and usurped during the period of the civil wars; and the treaty of Utrecht, concluded four years afterwards, was based on the integrity of the charters of James I. and Charles I. to the Alexander family and the baronets. Then came the rebellion of 1715. In 1721, meetings of the baronets took place in Edinburgh relative to their rights and privi-

leges; and ten years later, in a case of a corresponding nature, submitted for the opinion of the attorney and solicitor-generals Yorke and Talbot, those eminent lawyers laid it down—

That the original grantees had not by neglect been guilty of any *laches* of a kind to create a forfeiture of the rights conveyed by their charter; that the country, not having been yielded by the crown of England to France by any treaty, the conquest thereof by the French created, according to the laws of nations, only a suspension of the property of the former owners, and not an extinguishment; that, upon the re-conquest of it by General Nicholson, all the ancient rights, both of the province and of private persons, subjects of the crown of Great Britain, did revive, and were restored *jure postliminii*; that the crown had not power to appoint a particular governor within the bounds in question, or to assign lands to persons desirous to settle there; and that upon the whole matter they considered the grantees ought not to be disturbed in their possessions, nor interrupted in carrying on their settlement of the lands granted to them.*

Three years later, in 1734, meetings again took place in London of the baronets of Scotland, on the subject of their family rights, but nothing is distinctly known of the precise nature and character of the steps adopted. Between this date and the treaty of Paris, the Scottish rebellion of 1745 interposes itself. But shortly after the final restoration of New Scotland in 1763, down to the breaking out of the revolt of the United States, we find the baronets working vigorously at the revival of their chartered prerogatives. First in 1775 and 1776, by various meetings and proceedings, they revived the long disused distinction of their Orange ribbon and badge; and next, in 1777, they appointed a standing committee of their number, the Earl of Home, preses, to prosecute their territorial claims; they had prepared a plan of Nova Scotia, describing the particular grants belonging to the first created one hundred and eleven members of the order; and, together with this plan, and an abstract from their charters, they presented a memorial to the government. This document, dated the 7th of March 1777, and signed by a quorum of the standing committee, viz., Lord Elphinstone, Lord Elibank, Lord Banff, Sir James Grant, and Sir Michael Bruce, adverts in the preamble to the institution of the order, to the acts of parliament confirming its rights, to the endeavours made by the baronets, from 1625 to 1645, to improve their new acquisitions in Nova Scotia, to the calamities of the latter portion of the reign of Charles I., which soon diverted their attention from that distant country and engaged them in the general interests of the nation, and to the seizure of the province by the French, in whose possession, some intervals excepted, it had remained till the conclusion of the peace in 1762, by which it once more became an integral portion of the British dominions. It then proceeds to say—

The baronets presume that no prescription of land can operate against them while their property was forcibly withheld from them by a hostile nation. They

* Vide Chalmers' "Opinions of Eminent Lawyers" (1815.) Vol. I. pages 78 to ...

can, therefore, have no doubt that their lands have now legally reverted to them, and they have directed us to solicit the government's countenance and assistance in making an application to the king to restore them to those rights of their ancestors. The difficulty of assembling so many different claimants, may have hitherto prevented a general application. And the impropriety of separating particular pretensions from the general interest of the order may have hindered individuals from advancing their particular claims. But we flatter ourselves your lordships will not think a general application now too late. We ask not for new rights; we ask only the possession of rights already established. We have the honour to rank ourselves with those friends of government whose attachment to the laws and liberties of their country hath taught them zeal for the dignity of the crown, and affection for the person of the sovereign. If his majesty should be pleased to reinstate us in our ancient properties, we know that the influence which might arise to us upon the Continent of America, would be faithfully employed in his majesty's service, and we flatter ourselves might be of some importance in disseminating the principles of genuine patriotism and loyalty.

On looking at the Nova Scotia question, the first impression is, that it is an old world story, going back to the days of good King James. But the fact is, the proceedings with which the order is now engaged immediately connect themselves with those taken in the reign of George III., which again derive themselves from others that form links of *one continuous chain*, extending through a century and a half of troublous reigns, social casualties, and national catastrophes. Since James I. annexed Nova Scotia to Scotland, that "the use of its dominion might arise to the benefit of his ancient kingdom"—since he devised the plantation of New Scotland for ever "to promote the opulence, prosperity, and peace of his native subjects—since, from his deathbed, he enjoined a perseverance in this royal work, as "being a noble purpose, whereby the Scottish baronets in particular, and the whole Scottish nation generally, would have honour and profit"—what is it that we and our ancestors have not witnessed? First, a throne overturned and saturated with a monarch's blood; next the revolution of 1688; next the rebellions of 1715 and 1745; next the loss of the United States of America; next Irish convulsions, Canadian outbreaks, and the sanguinary devastations produced by the French revolution, and the long Continental wars issuing therefrom. In passing onward with our task, we advert to these memorable historical incidents as sign-posts on the way, to indicate whence it comes that our transatlantic Scotland still remains in an unpeopled condition, and how it is that our baronets are occupied in the year 1849 in measures for the revival of their American patrimonial rights. These measures took their rise at the period of the first famine visitation; and last June a deputation from the committee, consisting of the Honourables Sir William A. Maxwell, Sir J. Ogilvie, Sir Frederick Hamilton, Sir Thomas M. Cunninghame, and Sir Richard Broun, Baronets, placed in the hands of Earl Grey, colonial minister, a "*Memorandum*," stating that the objects for which the deputation had been appointed were threefold,—1st, To present a copy of a compilation entitled "The

Nova Scotia Question, with observations geographical and statistical—Historical Summary of events relative to the Baronetage of Scotland and Nova Scotia—Roll of Existing Members—List of Charters, and Opinions of Counsel;" 2d, To submit, on behalf of the Order, that, in lieu of all territorial claims, a consolidated grant shall be made to the baronets of 2,500,000 acres of the vacant land in New Brunswick, upon the line of the proposed railway between Halifax and Quebec (which line will pass over three hundred miles of unsettled territory); and, 3d, To place in the hands of her Majesty's government a formal protest against the sale, grant, or concession of any of the vacant territory within the province of New Scotland, as originally bounded, pending the settlement of the claim of right now urged by the baronets.* Further, since the commencement of the last session, a petition from Sir Richard Broun was presented to the House of Commons by Lord Marcus Hill, M.P., setting forth the steps taken in the matter of the Halifax and Quebec Railway and Colonisation project, and praying that all the documents and reports in the case, together with the memorandum placed in Earl Grey's hands by the baronets, may be referred for the consideration of a select committee.

Lord Marcus Hill presented the address to the Queen from the House of Commons two sessions back; and in the expectation that the committee sought will be granted, we shall conclude this article by some general remarks, grounded so far upon the details already given. It is an old saying as regards agriculture, that the man who can make two blades of grass spring where one grew before, is entitled to be considered a public benefactor; and we see no reason why the efforts of a committee formed for the purpose of adding two-and-a-half million acres of land to the territorial surface of Scotland should be regarded with public indifference. Already we have adverted to the institution, by James I., of the Irish Society of London, to aid and advance the Ulster plantation. In the recent work, "*Ireland; its Scenery, Character, &c.*," by Mr and Mrs S. C. Hall, it is stated, that "for above two centuries after the establishment of the plantation, the Irish Society were as utterly unacquainted with their estates as if they had been situate in Kamtschatka."

But of late, says the *Times*, in reviewing the book named, that body has been composed of men of high character, possessed of great energy, and influenced by sound and rational views; and the consequence has been, that, while they have taken care to inform themselves of everything relating to the estates under their control, they have wisely and zealously insisted on the intentions of James being carried fully into execution. They have considered themselves what in truth they are—trustees for the benefit of the Irish people; and their exertions to promote the welfare of the inhabitants of the county of Londonderry, and to force the city compa- [illegible] example of improvement to other landlords, ought to secure for them

* For copy of this *Memorandum and Protest*, see *Morning Herald*, 17th October [illegible]

the approbation and the gratitude of every real friend of Ireland. Actuated by a sincere and earnest desire to benefit the possessions of the companies, to ameliorate the condition of their tenants, and to promote their moral and intellectual improvement, the present members of the Irish Society have done everything which they had the power to do to secure the advancement of their just and beneficent designs. Nothing has been overlooked or neglected. The cultivation of the soil, the houses of the tenants and cotters, the fisheries near Coleraine, the manufactories within the district, the charitable institutions within the city and county of Londonderry, and the education and improvement of the young, have one and all received the most minute attention; and there cannot be a doubt, if the liberal and enlightened men who at present exercise jurisdiction over these estates be not prevented from fully carrying out their views, that both the moral and physical condition of the inhabitants will be, before long, improved to an extent which cannot fail to have a powerful and beneficial effect upon every other portion of Ireland. Had the Irish Society in former times acted with the same zealous spirit in which it is at present discharging its duty, Ireland would not have been in the condition which it now is. Had the estates of the companies been cultivated as they ought to have been, and had the moral improvement of the tenants been properly attended to, it is not too much to suppose that prosperity and comfort would have extended to other counties from the county of Londonderry, and that civilisation, and the blessings which flow from it, would have been communicated to the whole Irish people. Entertaining such views, it is impossible that we should be indifferent to the recent proceedings of the Irish Society, or that we should fail to give them every encouragement in our power to pursue the prudent and honourable course of action on which they have lately entered. If they succeed, their success will be an ample reward for all the abuse which may be heaped upon them; and whatever the Irish patriots of the present day may assert, they may rest assured that the effort which the members of the Society are making for the improvement of Ireland, even should it unfortunately have no result, will be gratefully remembered by posterity.

These observations we have quoted at full length, for they have a double bearing upon the question of the revival of Scottish baronet rights, and Scottish baronet duties, in the western hemisphere. The active conduct of the Irish Society of the present reign, after a torpor of two centuries, is a noble precedent for our baronets to follow; and the enlightened approbation of the proceedings of the former corporation, by the leading journal of Europe, reads a lesson for the instruction of our daily and weekly Scottish press as regards the latter. There can certainly be but one opinion throughout society as to the immense, the unspeakable benefits that would flow to Scotland from such a re-annexation as what the restitution to the baronetage of its territorial, political, commercial, and seignorial privileges in British North America implies. If, during two hundred years, such as have been the past, and notwithstanding the drawbacks occasioned by civil convulsions, voluntary neglect, want of agricultural knowledge, absence of mechanical power, intercourse disabilities, &c.—the addition of 818,344 acres in Ulster, to the private resources of fifty-five of the livery companies of London, has been the means of studding the vicinity of the Mansion-house and St Paul's with (instead of poor unions and workhouses) three spacious halls of wealth, patronage, and influence, in which the goldsmiths, the merchant tailors, the ironmongers, salters, clothworkers, drapers, mercers, &c. hold their periodical assemblies; what, under all the facilities which peace, science, education, civilisation give, would be the aggregate benefit which

Scotland would reap, during the next two centuries, from the addition in Nova Scotia of 16,000 acres to the private patrimony of each of those one hundred and fifty corporations-sole—*the baronets?* At a moment when Glasgow contains a Paria population of 30,000 vagrants, eating like a cancer into her vitals, and when every lane and alley in Edinburgh is overcrowded with fellow-beings whose condition is a living death, it may be well for the inhabitants of Scotland at large to lay to heart that colonisation abandonment in New Scotland is both a sin and a disgrace. Why is it that *a tenth* of the people of Scotland—250,000 souls—are in a state of abject pauperism? How comes it that begging appeals, soup-kitchen expedients, and relief boards, are ever and anon requirements in a state which ought to be the wealthiest and the happiest in Christendom? Is it because we have unfaithful rulers, men who serve the crown merely for the emoluments of place? or is it because we have no Scottish patriots in the present age, in the right sense of that word?—no men amongst us with hearts to love their country and people—with genius to devise improvements for their kind—men of purpose and courage to benefit and bless the age by working for it? It cannot be said, with banking palaces rearing their heads in all parts of our chief cities, with insurance halls, and commercial companies for gain-making of every kind and description, that there is any lack of lucrative industry in respect to things appertaining to man. And yet *man himself*, the masterpiece of the creation, for whom all earthly things are made and should be administered—*man himself*, who is better than houses, or land, or railways, or ships, or any work, or institution, is a drug, a worm! Since the year 1822 we have had a multitude of cattle-shows for the exhibition of fat kine: have we ever, during that period, had an exhibition of lean humanity? It would be a spectacle worth coming to see from the remotest corners of the earth, were the Highland and Agricultural Society of Scotland to drop for a season their character of food-production promoters, for that of *food-consumption* promoters, and to hold for once, on the Green of Glasgow, an exhibition of those men, women, and children in Scotland, who are living on whisky and tobacco, instead of beef and beer. We can appreciate the talent, and build monuments to the memory, of the novelist in whose pages James I. re-lives and occupies the position of a crowned buffoon. But Ulster is his standing monument; for there, as Leland observes truly, "the experience of ages bears the most honourable testimony to the design, and Ireland must gratefully acknowledge that there were the first foundations laid of its affluence and security." No testimonial on his native shore perpetuates the remembrance of that great man, whose duly supported efforts, in the close of the 17th century, would have laid the foundations of another Scotland on the Darien isthmus in these religious, social, and educational amenities which

make a nation powerful, glorious, and opulent in all the exalted senses of those terms. True it is, like James the First, Patterson has left on a foreign strand a prouder memento than any other Scottishman who ever crossed the Tweed, namely, *the Bank of England*. But he died, nevertheless, heartbroken in that cause which was the cause of *man*, not of mammon. It is to the fact that as a people we have obeyed the divine commandment, " Be fruitful and multiply—replenish the earth and subdue it" only in half; it is to the fact that we have neglected the dying injunction of James I, " Persevere for the furtherance of that royal work, *the plantation of New Scotland*, that it may be brought to a full perfection;" it is to the fact that we have declined from the standard excellence of those times in which Scotland could subscribe the *one-half* of her whole circulating medium to colonising enterprise,* that we have become a nation old in weakness, old in misery, old in crime.

A protuberant pig and a plethoric sheep don't look well, says a leading authority, by the side of a half-fed cottager. It suggests an odious comparison. It multiplies bitter reflections. How much does it take to rear a prize ox? How much a labourer's family? Which of the two has the greatest claims upon landlord kindness and care? Poignant questions these, and not to be listened to with a deaf ear. Tile draining, deep furrow ploughing, turnip feeding, breed improvement, these are all excellent in their time and place; and profitable too are these manifold essays on gorse, catch-meadow, chick-weed, &c. for which premiums have been offered, and prizes bestowed. But of a truth, surrounded on all sides with mortgaged landlords, bankrupt tenants, and starving labourers, we have had rather too much of that for which his Grace of Norfolk stopped the mouth of Farmer Oliver, at the Steyning agricultural show, viz.: " *Talk about cattle, and corn, and roots, and things of that description.*"

Since this memorable observation was uttered, " we have (according to the *Times*) turned the corner of a grand impediment," viz., the corn laws. And with their repeal, the days of landocracy inattention to the state and condition of the under ranks are drawing to a close. The sons of the plough will get wise in their generation, even as the sons of the power-loom are wise. Such reflections on agricultural policy as this—

You will feel that to have raised the labourers' condition to the social scale was an act more important on public grounds, and more gratifying for private considerations than it would have been to have filled Great Britain with mammoth oxen, or to have resuscitated the unhappy victims of the sirens' arts,

will yet bear humanity-blessing fruit. Nor as regards colonisation movements, will the men who, like the prophet of old, have been standing between the living and the dead, have for ever to use the reproachful objurgation,

We have piped unto you and ye have not danced, we have mourned unto you and ye have not lamented.

---

* The Darien Scheme, projected by Patterson in 1695, was supported by Fletcher of Saltoun and the whole Scottish nation. At this time £800,000 was the whole circulating medium of Scotland, and half of that sum was vested in Darien stock.

The voice of one who being dead yet speaketh, will arouse int action the nobler spirits of the age:

All the gaudy efflorescence of an affluent and high aristocracy is but tinsel an vanity when compared in respect of importance with the substantial wellbeing of thos thousands and millions who overspread the ground-floor of our social and politica edifice. To elevate this lowest platform of humanity—the platform of humble life—is the best object on this side of death to which patriot or philanthropist can conse crate their labours.*

The non-plantation of our colonial dominion wastes, the voluntary neglect by our baronets of the cause which is identified wit the bestowal of their family honours, will yet be esteemed by them not only as "a selling of their souls for that which is naught," but with them the bodies of thousands, and ten thousands, who ar dependent upon their ranks.† Neither whilst the saying hold good in the material world, "*Gutta cavat lapidem non vi sed saep cadendo*," will the periodical droppings upon the flinty heart of suc tears of moral suasion as these prove ineffectual:—

There is not a father by whose side, in his daily or nightly walks, these creature (the forlorn destitute young) pass; there is not a mother among all the ranks o loving mothers in this land; there is no one risen from the state of childhood, bu shall be responsible in his or her degree for this enormity. There is not a countr throughout the earth in which it would not bring a curse. There is no religion upo earth that it would not deny; there is no people upon earth it would not put to shame.‡

In the file of the *Scottish Herald* for November 1844, we fin in the speech made by Sir Richard Broun to the general meetin of baronets which appointed the committee for Nova Scoti rights, the following passage:—

The appointed mission of this nation is evidently to people the boundless region of North America with a race of men possessing the purest religion, inheriting th richest literature and proudest history, and endowed by nature with the largest shar of personal energy, perseverance, moral courage, self-command, habits of order an industry; and, in a word, possessing the highest degree of aptitude for practica civilisation of any race which the world has yet seen. But extensive plans of paupe emigration are not any better than penal emigration. We have no right to cast ou among other nations, or on naked shores, either our poverty or our crime. This i not the way in which a great and wealthy people—a mother of nations—ought t colonise. Is it necessary, then, in addressing you whose special and glorious heirdom it is to extend Scotland over her boundless and exhaustless domains in th western hemisphere, that I should enlarge upon the deep and paramount obligation which rest upon you to take up and carry out the original objects of your order Are you not, by the grace of former sovereigns of this realm, really, and truly, and exclusively, the *High Stewards of Scotland* in things that will concern the grandeur, and the welfare, and the industry, and the peace, and the wealth, and th happiness of her people, on either side of the Atlantic, to the end of time? Wha the motto of the royal ensigns of Scotland's supremacy, on her own national cros counter-charged, which it is yours to plant on the nascent towers and citadels of tha which must ever be the *arx et domicilium* of British power in the western world? I not this—"*Munit hæc, et altera vincit*?" Methinks, then, for these ends, identifie they are with the wants and the wishes of millions who are ready to perish, th

* [illegible]almers.

† [illegible]ide a[illegible] "[illegible] defaults" [illegible] Simmond's *Colonial Magazine* fo [illegible]ust 184[illegible]

‡ Dicken[illegible]

chivalry of a thousand generations ought to stimulate your ranks. Is it not disgraceful to the honour, and the manhood, of all connected with it, that with family distinctions, and ancestral recollections, and posterity claims, and national obligations, and common rights such as no other body of the nobility in Christendom, except ourselves, inherit, that there is not in any one parish or village in Scotland, a single club for any purpose of utility whatsoever,—even those supported by penny-a-week subscriptions—that is not an institution more profitable to society, and therefore more useful and estimable, than the *baronetage* itself? Is this state of things, then, to continue?

Since that date, in a pamphlet published in 1837, entitled "The Nova Scotia Question, in connexion with the relief of Highland and other destitution," Sir Richard observes—

We have, of late, had three visitations:—1. *Free-trade delusion*, scattering seeds which, if left untended, will shortly spring up in worse forms than that of 'armed bands.' *Railway mania*, uniting the inordinate lust that actuates the money-mongering classes; and *corn-law repeal*, breaking in upon the apathy that congeals the landed aristocracy. If we are to lay these startling lessons aright to heart, we will see that Providence is shutting us up to that course by which we shall substitute the conquests of peace for the trophies of war, by adding new regions, not to the blood-stained car of some selfish despot, but to the hearth-seats and the uses of the British family. We have masses of starving compatriots in different districts of Scotland, England, and Ireland, far outnumbering the three armies at Waterloo; and now is the time for another sort of rivalry than the battles of the senate or the field. In Ireland, £8,000,000 of money, and 130 workhouses, is the penalty superadded to the famine and the pestilence which there devastate the people. Shall we in Scotland wait the recurrence of a third visitation, or shall we now, by a general movement, enlarge our borders by diffusing our population over our majestic outlying confines? It will be found the truest policy to husband our internal and draw out our external resources.

And finally, in his recent address to the committee of baronets, on the 16th of October last, these remarks occur:—

We seek the restitution of our rights and privileges on the highest of all public considerations; and we say further, that their restitution to the fullest extent compatible with the advanced state of society can be urged upon, and is supported by, the most exalted principles of national justice, humanity, and policy. What would be the practical working out, by the baronets of Scotland, of that well-devised code of polity which their charters contain, but simply this—the creation in British North America of a reflex of Scotland, not as what she was in the dark periods of her feudal system, not as what she now is, ulcered over with the worse than *pit and gallows* bondage of pauperism—but what she ought to be, and will and shall be, when her natural resources are fully developed, and when want, ignorance, and vice are generally put down, by means of that noble and ever-active and efficient machinery in her churches and in her schools, which has already made her the best bulwark of the Protestant faith, and the purest exemplar to Europe of whatever is highest in monarchical loyalty, in constitutional fidelity, in industrial enterprise, and in social worth. The properties belonging to the baronets, two and a half million acres—half the arable surface of England and Wales—if selected in consolidated blocks of seven baronies each, would put a simultaneous plantation machinery at work in New Brunswick, equivalent to that which would be produced by upwards of twenty new corporate associations. But no mere commercial company can do the work that this order united can accomplish. For the *prestige* of an old nobility, in the heading of an enterprise of this description, is a thing which money cannot manufacture, nor a reigning sovereign create, nor a democratic government countervail. Hence, if we are ever to have a *crusade of peace* to the western hemisphere, its leading staff can alone be wielded by the baronets of Scotland—a body whose family honours are identified with this cause, and whose hereditary titles render it onerous that they should advance it in every age and reign. In this view of the case, well may the writer of one of the letters on the table—one of the most intelligent and loyal men in Nova Scotia—remark: 'The offer of the baronets to take the new grants of 16,000 acres each, in lieu of their original grants, is one of *favour* to the imperial government and to the

colony.' That it is both, will be a question to no mind in which dwells any corre perceptions of public virtue. No nation was ever so gifted, so fitted, as is Scotlan for colonisation enterprise. And when the 150 baronies and regalities of her bar nets become not cesspools for the reception of such drift as the ravages of hunger a want ever and anon waft across the Atlantic, but plantation-adjuncts to our Sabba and industrial schools, where the rising generations of generous Scottish youth a continually being trained in the pathways of religion and science—who can estim the moral and social excellences of such a course, or shall dare to arrest it in its ward progress to so glorious a consummation?

But enough: we have been speaking for the poor in the unc grades of life in most of the preceding paragraphs. We will cl this article by also saying something for the poor in the up circles. Sir Robert Peel, in the session of 1844, mentioned in place in Parliament, that since his then recent accession to office had received applications for government appointments from no l a number than twenty-two thousand persons. How many of th were indigent Scottish gentlemen? Referring to the nepotism the only Scottish member of the baronetage who has a seat in cabinet, a daily paper has just observed—"Were Christopher at the Admiralty to-morrow, the Slys would soon be as great family as are the Elliotts." But when the rights of the Scott baronets are restored, no Scottish gentleman need beat at any d in Downing Street for honourable employment; nor need a apprehensions be felt on account of the diminution of state pat nage which will attend the army and navy retrenchments conte plated by Mr Cobden. In his review of *Tracts on the Corn La* in the first number of the *North British Review*, (May 184 Dr Chalmers remarks—

We profess ourselves to be not so confident as many of some *great econo good* that is to come—some vast enlargement to the capabilities and wealth of nation—from the abolition of the corn laws. Were the *sea to recede ten miles fr our shores all round the island, and leave an exterior margin to that extent of ara land*, there might take place some such expansion in our affairs as this would g rise to.

Now, the reannexation of New Scotland to Old Scotland wo do more than add ten miles of circular coast to our native land it would treble the surface acreage of our natal soil—and be suc mighty and permanent enlargement of the national capabilities a wealth, as to bring prosperity and ease alike to our cottages a halls. This is worth considering, at a juncture when, in sister isle,

From every side we hear the crash of falling families and fortunes; when m bers of the old patrician houses, the most ancient and aristocratic in the land, daily becoming outcasts and beggars—when one commoner, supposed to be wealthiest and safest proprietor of the south, flies in disguise from his ancient ca alone and unattended, to avoid the inconveniences of the *Gazette*—and when ano gentleman, with a nominal rent-roll of £10,000 per annum, lately high sheriff i most important county, is now waiting at the office of the poor law commission seeking for the appointment of a vice-guardianship;— *

* ... *...nal*, January 1849.

Again, whilst in the Old World,

All around us is convulsed by the agonies of great nations; whilst governments which lately seemed likely to stand for ages, have been on a sudden shaken and overthrown; whilst the proudest capitals of western Europe have streamed with blood; whilst all evil passions—the thirst for vengeance—the antipathy of class to class, of race to race—have broken loose from the control of divine and human laws; whilst fears and anxiety have clouded the faces and depressed the hearts of millions; whilst trade has been suspended, and industry paralysed, the rich have become poor, and the poor poorer; whilst doctrines hostile to all sciences, to all arts, to all industry, to all domestic charity—doctrines which, if carried into effect, would in thirty years undo all that thirty centuries have done for mankind—have been avowed from the tribune, and defended with the sword;—*

Whilst looking eastward, such things prevail; and whilst, in the New World,

With the colonies crying out for more labour, and the parishes for lower rates, it is much to be feared that both parties will be content with a shipment of pauper outcasts—the dregs of the streets, the leavings of the unions, and the sweepings of the gaols; whilst thus, at no distant date, our colonial pasture-lands will be swept by a cloud of metropolitan vice, ignorance, infamy, and dirt; whilst the foundations of new states will be laid in the squalor of unredeemed misery—will grow up amid the brutality of untutored barbarism—and will be consecrated by the execrations of the most reckless blasphemy; whilst, instead of a human *polity*, we shall have created a pandemonium, and converted that which might have become a *great empire* into a hideous democracy;—†

Whilst these and other such considerations press in upon us from every side, now is the time for Scotland to awake, and to take up the functions of her high colonisation-calling in British North America. With her it is yet called "to-day." Let her occupy alike her opportunity and vantage-ground. Let her reassert and exercise her birthright interests in the western world. Steam has brought Glasgow and St John as near to each other in 1849, as were Leith and London in 1825. Let all ranks, then, and classes in Scotland lay shoulder to shoulder to achieve, in the present reign, a nobler boast than that of James I., namely, that he had made the Tweed the heart-stream of a united kingdom. Let it be ours to make the Atlantic the heart-ocean-stream of *one* mighty monarchy—of a *Great Britain* indeed. Free-trade measures have destroyed that which is the essence of colonies—we mean protection. Let us, so far as New Scotland is concerned, destroy there the very name of colony, by merging it in re-annexation to the parent realm. That integral part and portion of Caledonia must neither be lost nor given away. We are told that "the new movement in favour of financial reform will correct many of the anomalies of national government, and prevent the younger sons of peers from being quartered, as hitherto has been the system, on the finances of the country;" and a paragraph, headed a "*Peer's Prescience*," is travelling the round of the provincial press, showing what the shadow of these coming yearly loppings off of £10,000,000 is already effecting as regards establishment reductions and stud

* Macaulay's *History of Europe*. † *Times*, 1848.

parings-down. Let the prescience of the thirty peers and 150 baronets forming the Nova Scotia order be, to cast out 150 sheet anchors into that portion of the ancient royal province now called New Brunswick; let them plant upon their baronies and regalities there 150 Scottish clans; let this work be done on the broad principle, and for the beneficent ends contemplated by the royal founder, namely, "*the opulence, the prosperity, and peace*" of all his subjects; and when that day comes, the *Baronetage of Scotland and Nova Scotia* will be a state-institute twice blessed, blessing both the mother and the daughter country. The plantations of our domains on the southern banks of the St Lawrence, on a grand and comprehensive scale, is such an undertaking as to throw into the shade all other devices, plans, projects, and enterprises of the age; and the men in Scotland who, after the memorable warnings of the last few years, shall dally, patter, and equivocate with their plantation duties, are to be accounted such as, in a former era, would have played the coward on the field of Bannockburn, and, in days more recent, would have headed the massacre of Glencoe. Many times and oft, in the olden age, social atrocities the most astounding were perpetrated under the shield of the reflection—"It is a far cry to Lochawe." But the red-handed, the iron-mailed morality of foraying generations had at least this redeeming quality—their charity began at home. Theirs was the stern fire-side virtue expressed by the Border slogan, "Ye's want or I's want;" a virtue that qualified, so far, the breakfast offering of a clean platter and a pair of spurs. In those days men did not, in the course of four years, subscribe £242,351,320 for railway-making, and, within the same brief space, coolly permit an unregulated, unaided, unprovided-for emigration "*sauve qui peut*" of 687,656 souls! But whilst pondering over the arguments for colonisation advancement which these statistics involve—whilst laying to heart that the returns made by the emigration officers show that, in 1847, upwards of 25,000 persons died in the passage out, or immediately after landing—the mortality under similar circumstances, in 1848, exceeding 13,815, an amount of national blood-guiltiness alone surpassed by the inordinate cupidity which the above railway figures display—let us also remember that five years of precious opportunity has irrevocably been lost since these striking remarks were written.

[illegible]urveying our past and present history, we cannot evade asking ourselves the question, If the millions we have spent, and the energies we have wasted, in fruitless conquests and pernicious luxuries, had been applied to the development of our internal resources, and the culture of our foreign possessions, how much different would be our position at the present moment? The past cannot be recalled, but the future may be improved. If we would escape the ruin which has entombed every empire that has preceded us, war, luxury, and every species of extravagance must be laid aside, and our whole resources devoted to the peaceful pursuits of industry. I[illegible] [illegible] resolved upon, it must not be the wretched, torn-down, and barbarous [illegible] [illegible] accustomed to. The capital, genius, states

manship, and enterprise of the empire must be thrown into it. Expeditions must be deliberately planned, and communities fully organised and equipped, so that their departure from our shores may not be marked with the tears and groans of dejected slaves, but the joyous looks and light hearts of brave and free men, proceeding on a noble and heavenly mission—the establishment of colonies in the dark regions of the earth—bearing in their hands the torch of Christian civilisation, the horn of plenty at their feet, the wreath of liberty on their brow, and every blessing in their train that is worthy of their mother's name and magnificence.*

Again, then, we say, let the banner of the colonisation cause, in the western hemisphere, be as a *banner displayed* throughout the length and the breadth of Scotland. And let there now, and at once, be a union of all ranks, from Maidenkirk to John o' Groat's, who will put shoulder to shoulder, and add purse to purse, that the royal national work commenced by James I., for the plantation of New Scotland, shall be renewed and brought to a full perfection.

THE GAME LAWS.

In considering many of the recent legislative changes affecting our national interests, it is curious to compare the consequences as predicted by their more zealous advocates, with the results that have actually followed. In almost every instance the evils were represented as so enormous, that we were entitled to expect from their removal benefits of corresponding magnitude; and we cannot help admiring how these have been so disproportionate, and that we find ourselves, in all essential points, so much in the same condition as before. It is curious to observe how rapidly a real grievance, although not in itself of great importance, when once taken under the fostering wing of a portion of the community, outgrows its actual dimensions, and shoots up into a monster evil under which the nation groans, and the very foundations of society totter! The idea, once taken up, is kept so continually before the mind, that it comes to engross it with the intensity of a monomania; it meets us at every turn; we see its ramifications everywhere; it becomes, to the disordered fancy, the grand incubus of the times, before which every other sinks into insignificance, just as a small object, when held near the eye, may conceal from our view even the sun in the firmament. Weak minds believe in the good promised from its removal, because others so confidently assert it; benevolent minds follow their example, because they wish it may be true; public speakers find in it an attractive theme for popular declamation; and it is often not till long after the object has been carried amid general congratulation, that its advocates awake to the conviction that they have been in no small

* *Scottish Herald,* 1844.

degree under a delusion. They have overrated the extent of the evil, and consequently the extent of the expected benefit. The political regeneration of the country must be attempted anew; some fresh nostrum must be concocted. It is painful to think how slow we are to profit by the lessons which such considerations should teach us, and that as each new question arises, we are sure to witness in the discussion of it, the same partial views, the same special pleading, the same gross exaggeration—to be followed, in due time, if the object be carried into effect, by the same disappointment in its results, and the discovery that society is much in the same condition as before this new panacea was applied to it.

A process of this kind has for some time been going on in reference to the game laws. Often complained of in former times, they are now found out to be an unmitigated and intolerable mischief; the cause of so much social and moral evil, that even a modification of them ought not to be listened to, but the whole system completely swept away. In this way only, it is alleged, can agricultural produce be effectually protected; perpetual and almost irresistible inducements to break the laws, and incentives to numerous crimes removed; and so many social benefits secured for all, that it would be delightful to contemplate the prospect if we could persuade ourselves that it was altogether real.

In such representations there is the usual amount of exaggeration, arising in some cases from conscientious convictions founded on imperfect knowledge, and in others perhaps intentionally resorted to by the game-law abolitionists as a means of attracting attention and reflecting importance on themselves as the champions of so great a cause. But we are far from alleging that in this case there is not a real grievance. We think that it is not easy to reflect on the present state of the game laws, and to have some experience of their actual working, without coming to the conclusion that they are the cause, directly and indirectly, of not a few substantive evils, which ought to be redressed. Very few are now to be found who venture to defend them at all points. Many of the most zealous sportsmen and game-preservers are willing to admit that they give rise to serious abuses, and are ready to make important concessions that these may be corrected. This being the case, it becomes a matter of greater regret that so unconciliatory a spirit has been shown by the opposite party. They have too hastily taken it for granted that all redress would be denied. Having raised the cry *Delendum est!* they think it due to their consist[illegible] to persist in it. We are willing to admit that the [illegible] present system appear so considerable, that if there [illegible]native but to maintain it as it is, or to abolish it [illegible] latter would be the preferable step; but there is [illegible] this case a medium, where, as in so many other cases, truth must still be found to rest. A modification, or

remodelling of the game laws, however much it may have been deprecated, is the measure by which alone all reasonable grounds of complaint may be removed, the interests of all parties secured, and by which we can avoid the absurdity of correcting one abuse by committing another.

There is one consideration, indeed, which, if well founded, ought to put all modification of these laws out of the question, and make their repeal imperative. If, as has been alleged, game cannot, from the nature of things, be justly constituted property; if it can be no more considered in that light than the air we breathe; then, of course, no individual appropriation of it should take place. No modification, for example, of the slave laws could with propriety be admitted, because they infringed the first principles of natural justice, and violated the inherent rights of human nature. But the circumstance of game being *feræ naturæ*, constitutes no title analogous to this, nor gives them any just claim to exemption from the conditions that attach to other property. Are not rocks, and minerals, and land, originally and naturally, as free to all as the birds of the air, or the fishes that people the waters? The former become the property of individuals under the sanction of laws enacted for the good of the community; and in what respects do the latter, in this point of view, differ essentially from them? It is true they form property of a more precarious nature; birds are not fixed to a spot, and riches consisting of them may literally take unto themselves wings and fly away. They, like fishes, thus form a kind of *moveable* property, but it may be legitimate property notwithstanding. Such a strong family likeness, too, prevails among these animals; one partridge is so perfect a fac-simile of another partridge; that it may be impossible to identify them as pertaining to one individual rather than another, apart from the territory on which they occur. But these considerations merely impair their value as property; and if they are valued by the possessor, notwithstanding these disadvantages, who has a right to complain? It is well known that the law does not regard game *per se* as the exclusive property of any one; while at large it is *res nullius*, and it only becomes property when killed or captured. But this is a mere legal sophism, which does not essentially alter the state of the case. For if the act by which game is secured and passes into positive property, can only take place on a certain territory, from which the proprietor has a right to debar all whom he pleases, the game must virtually be regarded as the property of the individual to whom that territory belongs. What should disqualify a red deer from being looked upon in the light of property as much as a sheep? It is greatly the more valuable animal of the two; and that it is originally indigenous to the country makes no difference, for it would have been long since extirpated, had not great care and expense been bestowed on its preservation.

What can be more strictly feral animals than salmon? They spend half of their lives in the ocean, as far removed from all human control as can well be imagined; and when they revisit our fresh-water streams, they ascend them perhaps at the rate of a hundred miles a day, traversing the water, it may be, of fifty different proprietors. Yet no one supposes that these circumstances should prevent individuals from possessing a right to a salmon fishery. A similar observation may be extended to our national fisheries, which we have never heard it alleged were founded in injustice. Virtually, therefore, in the eye of the law, no less than in the light of common sense, game is as strictly property, both from the nature of the thing, and from legal sanction, as anything else that we are accustomed to designate by that name.

We are inclined to believe that the real value of game in this country is not in general fully understood. It is usually looked upon as kept chiefly for amusement, and its commercial importance is little thought of. Yet its direct value, as a marketable commodity, is very considerable; and its indirect value, as enhancing landed property, is so great that it is not easy to form a just estimate of it. The prices of ordinary game are pretty well known in Scotland; in England they are still higher, and there is always a ready demand. The value of a brace of grouse is, on an average, 6s. in England; pheasants, 6s.; partridges, 3s.; hares, 2s. each; woodcocks from 6s. to 10s. a-pair. The average value of a Highland red deer is not less than £5. So much for the direct value of game; and when we consider its importance indirectly, we are first led to think of the Highland moors which it has rendered so profitable. For the following facts on this portion of the subject, we are indebted to an able letter on the game laws by Lord Malmesbury.* A vast number of moors are now let for £400 or £500 a-year, which formerly brought nothing to the proprietor, as they are unfit even for sheep. Large tracts, which formerly let as sheep-farms, are now converted into deer-forests, and pay at least one-third, and even one-half, more than they did formerly. 500 deer may be kept on a space of ground that will feed 1200 sheep. Valuing the sheep at the average price of 18s. each, these would be worth £1080; but the deer would realise nearly double that sum, namely, £2000; for the average price of stags in summer, and hinds in winter, is fully £4. From a long-standing knowledge of the Highland moors, Lord Malmesbury is of opinion that they are yearly advancing in price, and becoming a more important kind of property. He saw a list, last year, of 106 moors let for shootings, the rent of which could not be averaged at less than £300, which

* [illegible] *Game Laws.* A Letter from the Earl of Malmesbury to the Right Honourable Sir George Grey, her Majesty's principal Secretary of State for [illegible] Hatchard and Son. 1848.

makes a total of £31,800. There were twice as many more let at an average of £100, and a third portion unlet, whose value may be fairly stated at £17,000, the whole making together a rental of £70,000 on the Highland shootings. He adds, that this may be looked upon as a clear gain as far as respects the grouse moors, and an increase of two-fifths on deer-ground, called "forest."

Another way in which the indirect value of game very strikingly appears, is the importance it gives to a country house when it is let. It is impossible to read the numerous advertisements relating to country residences of any consequence, either offered, or required, for hire, without coming to the conclusion that a very small proportion of them, indeed, are cared for, if the privilege of sporting is not attached to them. But with this recommendation, they readily find occupiers, even though placed in remote, and otherwise unattractive, parts of the country. This fact forcibly shows the estimation in which sporting is held, and the consequent value, as property, of the animals which afford it.

And this leads to the further observation, that in forming an estimate of the value of game, we must not overlook the enjoyment and recreation which a considerable portion of the community derive from the pursuit of it, and the influence it has in inducing proprietors to visit and reside on their country estates. It is unnecessary at present to inquire into the causes of it, but the fact is well known that British landowners have been addicted to sporting beyond any other corresponding class of men in other parts of Europe. It has long formed one of the national characteristics. The taste is so strong that it often amounts to a passion; and it has exercised, in some instances, considerable influence on our most important affairs. It has regulated the time of the sitting of parliament; and that, in its turn, has determined what is called the London season. It has had influence enough to establish the absurd and unnatural practice of carrying the habits of winter late into the spring, and to detain multitudes in a large city at a time when the country puts on most of its beauty. It would, indeed, be a matter of no small concern that would keep many of our senators on their seats on *the* 12th. If some dire necessity compelled it, "My heart's in the Highlands," &c., would be the best interpreter of their sentiments. It may be difficult to analyse the causes of the pleasure derived from shooting. The love of fire-arms shows itself very early in most boys; to many individuals the mere handling of them affords pleasure.* The consciousness of power, the exercise of skill, the exciting uncertainty, the exhilaration arising from air and exercise—these circumstances, combined, as they generally are, with fine weather and beautiful scenery, must all enter as elements

* This was strikingly exemplified in Lord Byron, but only because he was more accustomed to gratify his feelings than most others. The feeling is very general.

into the pleasure of this kind of sport, and they are sufficient, without the aid of others, to account for the eagerness with which it is followed. That it has been the cause of residences being built in all parts of the country, and induces proprietors to visit and reside on their estates, is so avowedly and obviously the case, that it is unnecessary to do more than mention the fact. The benefits that have thence arisen, in the general improvement of the country, and in the condition, more especially, of the rural population, are equally obvious; but these we do not at present insist on.

With all these facts before us as to the value of game, what shall we think of the assertion, gravely made, that the enactments by which it is protected, do good to no class—are for the real interests of nobody—not even of the proprietors themselves! * It surely cannot be denied that the interests to which we have adverted, are important interests. It is equally clear that they have gradually grown up under the sanction of the laws, and considerable sacrifices may often have been made to secure them, in the faith of the permanency of these laws. In a country where property is respected, they are not lightly to be tampered with; and no honest legislature would contemplate the repeal of the laws by which they are upheld, except for reasons of the most urgent kind.

Such reasons the opponents of the game laws profess to give. They think they see effects resulting from them which are incompatible with the wellbeing of large and important classes of the community. The charges they bring against them are of so grave a kind, that if they could be established to the full extent attempted, it will generally be admitted that the interests above alluded to, important though they be, should give way to them. It is alleged that the superabundance of game often reared under the provisions of these acts, is so destructive to the crops, that it occasions great, and not unfrequently ruinous, loss to the farmer; that by establishing an antagonist interest between tenant and landlord, the game laws give rise to mutual jealousy and heart-burnings; and that for these, and other reasons, they are incompatible with the prosperity of agriculture as a trade. Another evil of a still more serious nature is asserted to arise from them—namely, that they are the fruitful cause of demoralisation and crime among the rural and labouring classes. There are other charges to which we may afterwards advert; but these are the most important; and it is on the opinion we form as to these, that our judgment of the game laws ought mainly to depend. They are well worthy of attention.

The complaint as to the injury done to the farmer by the damage of his crops, is *so far* met by the consideration, that he takes

* [illegible] Game Laws [illegible] Essay, by Mr Shepherd, p. 2.

his farm well knowing that it labours under this disadvantage. It is expressly stipulated that the landlord reserves to himself the game on the land he lets. The tenant, therefore, is assailed by no unexpected calamity; he anticipates injury from the game; it is what he has made up his mind to submit to; it is one of the conditions of his lease which, we must suppose, he has honestly engaged to fulfil. It is a contract voluntarily entered into on his part; nay, which he eagerly courted; for the competition for farms, notwithstanding the increased drawbacks complained of, is greater than ever. In such circumstances, may it not be reasonably regarded as a breach of good faith to complain of injustice and hardship? The farmer may not have made a good bargain, but he made it with all the circumstances before him, and it may fairly be retorted on him that he is himself chiefly at fault. Many farms also, especially in England, are let at what are called game-rents; that is to say, it is expressly understood that the crops are liable to be infested with game, and a lower rent required on that account. These considerations at least show that landowners are not insensible to the losses caused by game, and that if they choose to preserve it, so as to render their property a source of amusement as well as of income, they are willing to sacrifice a portion of the latter for the sake of the former.

There can be little doubt that the extent of the damage caused by game has been represented, in the statements recently laid before the public, as much greater than it really is. We do not affirm that this has been done wilfully for the purpose of making out a strong case to engage public sympathy, but in a great measure by mistake, and not attempting to discriminate. A field of wheat is seen to have received damage from birds; an examination takes place, and an estimate formed of the extent of the injury. The likelihood is that it will be exclusively ascribed to the winged game that happens to predominate in the neighbourhood—most probably pheasants. Yet how many different kinds of birds may have shared in the plunder! Flocks of hungry finches, rooks, pigeons, and, above all, wood-pigeons;* but the pheasant is the only tangible and responsible party, and the whole is put down to his account.

This bird is the most obnoxious species of game to the grower of

* It is admitted on all hands that the wood-pigeon, which does not enjoy the protection of the game laws, is one of the most destructive birds we have, yet it has been allowed to increase to a great extent in all parts of the country. Mr Burn Murdoch well describes its operations in a wheat-field, which we have often had occasion to witness. "The wood-pigeon has a weak bill, but nature has provided her with very strong wings; when the flock, therefore, settle upon the lying portion of the wheat-field, instead of breaking off the heads and carrying them away, (as is done by the rook,) they lay themselves down upon their breasts upon the grain, and using their wings as flails, they beat out the pickles from the heads, and then proceed to eat them. The consequence is, that the pickles having been thrashed out upon a matting of straw, a great proportion of them fall down through it to the ground, and are lost even to the wood-pigeon; in short, they do not eat one particle for twenty which they

white crops, and his powers of destruction must be admitted to be considerable, both from what he eats and what he breaks down with his weight. But he does not feed so exclusively on grain as represented, and he frequently devours insects and grubs, which would themselves hurt the corn plants. Young pheasants do not thrive on grain; they prefer the seeds of other than the cereal plants, insects and their eggs, and suchlike food. It is only from the time the crops get into ear till they are housed, that they can do much damage; the young plant, as far as we are aware, is not molested by them; nay, they may frequent a field of young corn with advantage to it, for the reasons above mentioned. They have been shot with the crop quite filled with wire-worms, (in one instance it contained upwards of two hundred,) and it is seldom without some grubs or noxious larvæ. Mr Burn Murdoch has carefully investigated the habits of the pheasant, and thrown new light upon its history; but its habits no doubt alter somewhat in different localities according to the nature of the country. In the earlier winter months, according to this author, although a few pickles of grain may be found in the crop, its contents consist chiefly of leaves and shoots of wild grasses, insects, grubs, and larvæ of insects. Later in the season, insects, roots of weeds, and small pieces of vegetable matter, such as decaying potatoes and turnip-tops, are their chief support; while in spring, the roots of weeds, which they gather principally from ploughed fields, and insects, which never altogether fail them throughout the whole year, constitute almost their only food. The weed-roots, being very succulent in spring, seem to be highly nutritious; for birds which appear to have fed exclusively upon them, were found to be in high condition. When seed-time returns, they have an opportunity of again enjoying a grain diet for a time; but it is chiefly the pickles left on the surface that they pick up, (many of which would probably never spring,) so that the injury they occasion in this way can never be very great. In summer they resort chiefly to the woods and hedgerows, where they shift for themselves without interfering with the produce of cultivation.

When harvest arrives, upon an estate where the pheasants have been obliged during the whole year to feed themselves, no artificial feeding having at any time been furnished them, I can only repeat my conviction, founded on such observations as my experience furnishes, that while birds in sufficient number will have been found

---

thrash from the stalk. I have repeatedly watched this process from behind the trunk of a large willow-tree growing in a thick-set hedge on the edge of a wheat-field, and seen the operation go on within a couple of yards of me. The pigeons descend first singly, but having left a watcher upon the highest tree in the neighbourhood, the whole flock are soon at work on the same spot, and the loss of grain to the farmer is very great. They are also gluttons in quantity. I once shot a wood-pigeon in a garden, whose crop contained nine small-sized gooseberries, and a very large quantity of wheat. The number of these animals is increasing in an alarming degree, and during the winter of last year, (I speak within bounds when I say) I saw flocks of thousands feeding upon turnip fields." *Game and the Game Laws*, p. 11.

to afford sport during the winter, no such quantity will exist as to tread down or injure the growing crops; and the most diligent examination of these crops will be unsuccessful in discovering that they have been injured at all. The pheasants have, in truth, been a profitable stock on the ground. They have been subsisting upon weeds and insects injurious to cultivation, and upon other substances not useful to man; and in return they now furnish man with an article of wholesome and delicate food.*

If left to their own resources, and not fed artificially, this writer is of opinion that pheasants, *in reasonable numbers*, are able to provide themselves with food at all seasons of the year, (except perhaps in the case of a deep and long-continued snow,) on any soil or in any climate congenial to their natures, and that these numbers will in general be found sufficient for any purpose that deserves the name of sport.

The destructive propensities of rabbits are admitted on all hands, and the wish for their extirpation is almost equally general. They not only cut the herbage down as it grows, more perseveringly than hares, but also the corn in the ear. Not roaming so much about as hares, they damage the cereal plants in their neighbourhood very seriously. In this respect hares do much less injury; and probably much of the mischief done by them is laid to the charge of hares. None should be allowed to exist on arable lands, or in their immediate neighbourhood, and, for the most part, ample facilities are afforded for their destruction. They need no game laws to protect them; they can too well protect themselves.

Hares also cut down the corn crops from the time of their earliest appearance nearly to the time of harvest; and not only do they consume them, but they do almost equal injury by treading them down and forming roads.† When hares are numerous, therefore, they must be regarded as formidable enemies to the farmer, although their powers of consumption are not so great as has been alleged. It was affirmed, at a public anti-game-law meeting, that three hares will consume as much as one sheep, and six sheep as much as one cow. A farmer, examined before the parliamentary committee, having complained of the excessive quantity of game on his farm, received permission from his landlord to keep it down; and, accordingly, on his farm, which consisted of 2000 acres, 2500 hares were killed—being equal in their consumption to 140 black cattle. On this statement Lord Malmesbury remarks, that the first speaker, who declared that three hares eat as much as one sheep, might as well have told his audience that one hare could eat three sheep. The weight of a hare's paunch, when full, is under 1 lb., that of a sheep

* *Observations on Game and the Game Laws.* By J. Burn Murdoch, Esq., p. 20.

† The circumstance of hares roaming over a large extent of surface, so often mentioned as a proof of their greater destructiveness, is rather in favour of an opposite inference; for cropping a little here and there does not injure the corn crops in an early stage of their progress, but only causes them to tiller more widely, and thickens the growth.

21 lbs.; but if this calculation were just, the landlord of the second speaker, who has destroyed 2500 hares on 2000 acres, should have expected him thenceforth to keep 890 additional sheep upon his farm. Would he have done it? Hares are easily killed, and in many parts of the country they are becoming so scarce, that there is a chance of them being in time nearly extirpated. In by far the greater number of localities, however, they are certainly too numerous. The recent change of the law in regard to them, by which they may be killed without a certificate, will operate as a material check upon their multiplication, and will probably prevent them, in many parts of the country, from being any longer felt as a grievance.

We should be very sorry to see a war of extermination commenced against the partridge. We should regret the loss of its twilight cry among the rural sounds to which the ear has been accustomed, and which are so well calculated to awaken pleasing associations. It surely cannot do much harm. Plump as it is, it takes wonderfully little to keep it in that condition, and it draws its supplies mainly from sources not directly available for human use. Insects, seeds and leaves of common plants, and roots, are its sustenance throughout the greater part of the year. Even an occasional visit to a corn-field, unless when the birds are very numerous, cannot occasion much loss; and none, we imagine, will be disposed to refuse them the run of the stubble-fields when the corn is removed.

This brief glance at the kinds of game of which our farmers chiefly complain, will, we think, show that there are palliating considerations in the case; that the state of things to which the game laws have given rise, as far as relates to injury done their crops, is not one of unmixed hardship and injustice; that neither landlords nor the legislature have turned a deaf ear to their complaints; that a pheasant is not altogether an incarnation of evil, nor a hare absolutely the curse of the country. But we mention these things merely in extenuation of the evil; for, after all allowance has been made for them, we think a positive evil still remains, and one for which agriculturists are authorised to ask redress.

On taking the lease of a farm, a tenant cannot be supposed, in general, to be well acquainted with the extent to which it is liable to the inroads of game; nor are those who show the lands, being in the interest of the landlord, likely to be very explicit upon the point. It may not, therefore, be till after he has been some time in possession, that he discovers the quantity to be excessive,—a discovery made too late. But even when he knows at first that the game is in reasonable quantity, it is liable to increase, and it often does so very rapidly; this we believe to be the situation in which many farmers now find themselves. Moreover, an estate where little [illegible] game existed may pass into the hands of another

proprietor who breeds and preserves it till it swarm. In all these cases there is no legal redress. Remonstrances, and even an appeal to an expressed or implied understanding, at the time of taking the farm, that the game should be kept within moderate limits, are easily parried or disregarded.

Then look at the positive evidence as to the extent of the depredations. It is appalling. Several ascribe their ruin to the game. Many estimate their loss at one-fourth or one-half of their entire crop. One affirms, on oath, that he lost more than the amount of his rent by the injury done to his wheat-crop alone. Another estimates his loss, on certain years, at £800; another, in one year, at £1000. One individual counted eighty-three hares in a single field; another states that on his farm two thousand five hundred of these animals were killed annually. The most aggravated cases of this kind occur, of course, in England, but serious instances are far from being rare in Scotland. It is not long since the loss on a single farm in East Lothian is said to have been estimated at upwards of £800 for a single year. But it is needless to multiply instances; the parliamentary evidence furnishes them in abundance. Even admitting that there may have been mistake and exaggeration, enough remains to prove the existence of a monstrous abuse, a state of things which ought not to be tolerated.

Here, then, is a grievance for which the tenantry have no adequate remedy, and which, in most cases, they have no means of avoiding but by declining to take farms at all,—an alternative which landlords are not likely to desiderate. It is a case which seems fairly to call for legislative interference. And this can be done effectually only by modifying the present laws; the abolition of them, as we shall afterwards endeavour to show, unless accompanied by the abolition of other laws, which cannot for a moment be contemplated, would leave matters nearly in their present state. It may be assumed, that these aggravated evils are occasioned, among the animals included in the game-list, chiefly by pheasants and hares. The means of checking the undue increase of rabbits are already in operation, and it remains to be seen how far the relaxation of the law in regard to hares will answer the same end. Probably it will not be found effectual, for any proprietor who wishes to preserve them has merely to withhold permission from his tenantry to sport over their farms. It remains, then, to be considered what measures should be taken with respect to pheasants. Were compensation for their injuries enforced by law, it would be exceedingly difficult to adjust the amount of it, by arbitration or otherwise, while such a proceeding would prove an endless source of dispute and ill-will between landlord and tenant, and it would leave all the moral evils of the question untouched. On the principle that no one is entitled to manage his property in such a way as to injure his neighbour, or to endanger the common interests of the

country, it is competent for the legislature to lay such restrictions on the rearing of these birds as shall prevent them being an annoyance to others, or offering an inducement to break the laws. We attempt not to point out in what way this may best be done, but it may be accomplished without infringing the legitimate rights of property. The method suggested by Mr Burn Murdoch may be stated, as a specimen of one of the ways in which it is possible this end may be attained, in regard to those who wish to preserve a large stock of this species of game.

No man should be entitled to rear pheasants artificially, unless he did so in preserves properly and effectually secured against attack. Let him build a wall or a pallisade round his covers, which covers should also be placed in the midst of a certain quantity of ground under his own cultivation. The sheriff of the county might be authorised to inspect, or to appoint persons to whose judgment he could trust, to examine such places, and to report as to their fitness and security, before the proprietor could be entitled to rear or feed pheasants artificially; and all artificial breeding and rearing, unless so sanctioned, should be pronounced unlawful.*

Such a measure as this would be still more effectual in regard to hares, as they can readily be confined by a wall; but, to answer all the ends in view, it is necessary that the enclosure should be of such a description as to deter from all attempts to break into it from without. If proprietors were contented with a moderate stock of pheasants, such a stock as would be sufficient to yield sport, or rather which is alone fitted to yield it, and to retain a certain portion of land around their policy in their own cultivation, few complaints on this subject would probably be heard of. We are acquainted with numerous estates in the south of Scotland where a moderate supply is kept, and no one feels himself aggrieved. But if proprietors will continue to gratify what we take the liberty to call a perverted taste, and indulge in a mode of sporting from which the true spirit of sport is altogether excluded, it is necessary they should be told that this must be done without injury to others, and by submitting to such sacrifices and restrictions as a regard for the public good renders necessary.

Such restrictive measures as have been adverted to, cannot be more strongly recommended than by the further consideration, that they promise to afford a remedy, as far as the case admits of, for the moral and social evils which have resulted from the game-preserving statutes. That these evils have been very great, all admit and deplore. The penalties incurred by offences against those acts are extremely severe; they have been, in general, [illegible]ly enforced; yet the number of trespassers has continued to [illegible]se from year to year. The truth seems to be, that such accumulations of objects so valuable either for food or sale as are to be found in preserves, present temptations which it is extremely [illegible] or [illegible] destitute men to resist. There is a deep-seated

* [illegible] the Game Laws, p. 43.

impression, also, that there is, or ought to be, a common right to such animals, and that neither sin nor crime is committed by carrying them off, if detection can be avoided. Dissolute and desperate characters, of every description, find a most congenial employment in poaching; and every now and then respectable farm-servants and country labourers are drawn into the vortex. The mischief done in this way is no doubt great; but it seems to be the opinion of many, who have enjoyed the best opportunities of observation, that the majority do not commence their lawless career by poaching. Lord Malmesbury thinks it a great fallacy to suppose that if the present poacher could not poach for want of game, he would be an industrious man, and a sincere respecter of the law of *meum* and *tuum* in other matters. "All my experience," he says, "for twenty years in the country, and on my own property, is contrary to this assumption. The poacher generally does not begin by poaching. His evil career commences in idleness and debauchery, (often not his own fault,) he must find means to satisfy his tastes, and he then commits what, to his intelligence, and in his position, is the easiest and most profitable offence—the killing a pheasant, for which he can get half-a-crown. The pheasant is to the country thief what the silk pocket-handkerchief is to the London *prig;* but the quiet labourer, in full work and well treated, will live surrounded with game, and will no more think of poaching it, than a respectable apprentice in Regent Street would attempt to pick a pocket. I have known our labourers long and well, and have found them often the trustiest keepers. I have tried poachers, and I have prosecuted them; and I positively affirm, that they have almost all been men of dissolute habits, often smugglers (if on the Hampshire coast) who would do no work, and lived by no visible means."* But it is certainly no small harm to afford to such characters the ready means of carrying on a life of profligacy, however it may have commenced, of hardening them in vice, and removing inducements to amend their habits. And it is unquestionable that multitudes, every season, become amenable to the law, for the first time, by the transgression of these acts. The severity of the punishment at once fixes such a stain upon them that they lose their position, and find it difficult to recover the means of gaining an honest subsistence. They are thrown into society from which they catch further contamination, and in too many cases never extricate themselves from the evil influences with which one false step has surrounded them. No small proportion of those now spending their lives in our penal settlements, would doubtless date the career of crime which brought them thither, from their first violation of the game acts.

It is only when game is collected in inordinate quantities, that

* *Letter to Sir George Grey*, p. 17.

the temptation to poaching, and especially the worst form of it, night-poaching, becomes strong. From the habits of pheasants, in such cases, congregated in masses in their roosting places, the chance appears great of killing and bagging a goodly number in a very short time, and escaping with the booty before the alarm has been given. When the birds are in moderate numbers, and left to shift for themselves, they are continually changing their quarters, influenced often by the state of the weather, and scattering that they may more readily find food. Poachers could not, in that case, go to any one point with the certainty of finding them; when they happened to do so, they would obtain but few; and the extent of ground they would require to go over would render discovery probable, or rather inevitable. This risk would, in this way, be increased tenfold, and the profit diminished in a similar proportion. The temptation would thus be greatly lessened, if it did not altogether cease to be felt: at all events, it would not be greater than in a multitude of other instances where property is exposed, and would be sufficiently counteracted by the ordinary checks.

The same means, therefore, which would correct the agricultural evils connected with this subject, would be equally efficacious in removing the moral evils. The measures adopted to compel proprietors to confine game, when they choose to keep it in excessive quantities, within the limits of their private domains, so that it may not encroach upon the adjoining corn-fields, would require, at the same time, to be such as to render it inaccessible to poachers, and thereby remove the temptation which, in the present state of things, so many find irresistible. We are persuaded that there are few landowners who would not willingly make sacrifices to obtain these ends.

If it be in the considerations to which we have adverted that the real evil of the game laws resides, and if it could be removed by some such means as have been hinted at, it is of little consequence to inquire whether these laws be of *feudal* origin or otherwise. Such may be said to have been the character of the old law, repealed in 1830, which conferred the privilege of killing game only on persons of certain rank and title, withholding it from the humbler classes, even though possessed of land. They cannot even be called aristocratic, if that term is considered as implying anything exclusive, as all the rights which they confer may be readily obtained by all who have the ability and inclination to pay for them.

If we refer to another statement often made, that a great pecuniary loss is sustained by the public in the prosecution and punishment of offenders against these laws, it is for the purpose of showing how very partial a view of the question is often taken by the abolitionists. It must not be forgotten that sportsmen contribute a very large sum to the public treasury—about £163,626 annually

for shooting-certificates, nearly £165,691 as taxes on sporting dogs, while the retailers of game pay a license duty of upwards of £2000; making together £331,317, a sum nearly equivalent to one-fourth of the whole income-tax paid by Scotland. The great number of keepers in many parts of England have also been found to have, in no inconsiderable degree, the effect of a rural police; and were they withdrawn, that force would have to be augmented at the public expense.

Lord Malmesbury is of opinion that it is a great injustice to prevent small proprietors to appropriate the game on their lands, unless they pay £3, 13s. 6d. for a certificate. If the possession be small, the damage done to the crop must be calculated *versus* this sum. If the game be killed, the produce is kept entire, but the half of its value may be lost by the tax. Then about forty hares or thirty pheasants must be killed to cover the amount of the certificate. Such a proprietor is probably afraid of the speculation, and takes the chance of his richer neighbour (who possesses and preserves the ground around him) allowing him some compensation for damage done to his field. It is hard that the man with one acre lying in the middle of a preserved country, as he has a right to the game upon it, should be prevented by any *indirect* means from killing it. It is desirable, therefore, that every one should be allowed to shoot or destroy all game on his own freehold or copyhold land without a certificate.

There is an impropriety connected with the administration of these laws which must have occurred to every one as desirable to be removed, namely, that prosecutions are brought before the justice of peace court of the district where the offence was committed. By this arrangement it happens that the same individual may be virtually both prosecutor and judge—a proprietor may be sitting in judgment on an offence committed in his own grounds, the witnesses, at the same time, being his own servants. In sanctioning this mode of proceeding, it may be thought that the legislature has deviated from the principle by which it has been usually guided, in guarding so sensitively the administration of justice, from even the appearance of partiality. But the remedy for this seems simple and easy.

If the recent movement for the repeal of the game laws has been seriously made with the intention of extirpating, or even very materially diminishing, the quantity of game, it is difficult to conceive a notion more erroneous. Game may be protected, indirectly, otherwise than by means of these laws; and there is an existing statute available for this purpose. If they were abolished, proprietors would probably endeavour to have the law of trespass rendered more stringent and summary than it is; and it is difficult to see how this could, with justice, be refused to them. Relying on this law, either in its present state, or such as it may be easily rendered,

game preservers have little to fear from the abolition of the others, at least as far as regards poachers. It may be thought, indeed, that the case would be somewhat altered as to the relation between landlord and tenant. The latter could not be regarded in the light of a trespasser while on his own farm; and if the game laws were abrogated, and no arrangement to the contrary entered into with his landlord, he would be entitled to kill all the game found on his fields. But it would still remain competent for the landlord, equally as at present, to make what stipulations he pleased with regard to the game—he could still prescribe the conditions on which he will let his lands. He could still reserve a right to the game. This is a matter altogether irrespective of the game laws, and would stand, as it does now, on the footing of private arrangement. The only difference to the tenant would be, that, having obtained the landlord's permission, he could kill game without paying any tax to the government. But the landlord could tie his hands in the same manner as at present, and matters would continue very much in the same state as they are now.

To all others the law of trespass would apply; and farmers themselves would be among the first to find that it would be necessary to enforce it with the utmost rigour. Their crops would be trodden down, their fences destroyed, and their stock disturbed; and they would have to be continually on the watch against intruders. A force of keepers would still require to be kept up; the temptation to poaching would probably be increased, from the fact that game would now be common property; the same deplorable collisions would take place; and all the moral evils that flow from the present state of the law would continue but little abated. No law would be broken in killing or appropriating game, but a law would be broken in order to reach it. But poaching would probably come to be looked upon as involving no breach of morality, because in no respect could it be called theft or taking the property of others, and it would be engaged in without scruple.

The repeal of all the laws which protect game, directly and indirectly, would indeed lead to its destruction, but it would destroy, at the same time, some of our most valuable privileges with which game has no connexion. Such a step would go far to disorganise our whole social system. No property would be safe, no spot secure from intrusion. Fences, plantations, corn-fields, would be liable to perpetual injury. The improvement of landed property would be immeasurably retarded. The inducement to reside in the country would be diminished, because its security, seclusion, and many of the recreations to which gentlemen are attached, would be gone. The curse of a non-resident proprietary would be likely to follow. The capital in the winter, a watering-place in the summer, would become their habitual places of resort. Estates would be managed solely through the medium of factors. Along with a

decrease of employment for our peasantry, they would deteriorate in their habits and principles, from the want of any to feel an interest in their welfare, and promote their improvement. Some of the scenes of the south of Ireland might, in time, come to be realised in the centre of England and Scotland. Game would not, for a considerable time, become altogether extinct. Enough would long remain to tempt pursuit, for the price of these animals would be greatly increased, and gangs of poachers and unemployed gamekeepers would traverse the country at all seasons. This is no ideal picture, for these evils were realised in France previous to the year 1844, when game was free to all; and bands of idle and lawless *chasseurs* became so destructive to the crops, and dangerous to the inhabitants, that the enactment of a protective law became indispensable.

But though the law of trespass might perhaps be rendered effectual for the lowlands, it would be difficult to make it so for the Highlands, from the immense extent of the districts that would require protection. To deprive the proprietors of these sterile moors of the means they now possess of turning them to some account, would not only be most unjust to them, but also most injurious to a large portion of the Highland population. It is calculated that not less than £80,000 are spent by sportsmen annually in the Highlands of Scotland, over and above the shooting-rents. This goes chiefly to the poorer classes, who look upon the shooting season as their harvest. It is supposed that about 4000 men are employed in the Highlands as foresters, keepers of game and fish. Supposing the half of these to be married, and to have three children each, we thus have 12,000 persons supported by regular wages from this source. It has been calculated that the number of persons supported in a similar way in England and Wales is upwards of 62,400.* When we hear the game laws denounced as unmitigated evils, without the slightest admixture of good, and benefiting in no degree any class of the community, these considerations show how recklessly such assertions have been made.

The operation of these laws has, in point of fact, been very much mitigated of late. That they were formerly harshly administered, and even strained to the utmost, cannot be denied, and occasional instances of their abuse may still at times occur. But their provisions have, in several points already referred to, been considerably relaxed; and the spirit of the times, which is opposed to severity of punishment as the best means of repressing crime, has had the same influence on the application of them as it has exercised on nearly all our other penal statutes.

We are therefore obliged to revert, with even stronger convictions than before, to the statement with which we set out, that it is

* Lord Malmesbury's Pamphlet, page 24.

not in the repeal of the game laws, but in their modification, that the evils complained of will find their best remedy. Evils, as we have seen, have been attributed to them with which they are by no means justly chargeable—consequences have been supposed to flow from them with which they have no necessary connexion. The real grievances to which they give rise, we have endeavoured to point out. These grievances, the repeal of the laws in question would either not remove, or, while it did so, it would substitute others of an infinitely more grievous kind. But they are of such a nature as to admit of correction by the legislature: and it is to be hoped that the subject will be taken up during the present session of parliament, and adjusted in such a way as to preserve, on the one hand, the just rights of proprietors, and remove, on the other, all ground of reasonable complaint on the part of the public.*

* Since the foregoing observations were in type, we have perused a statement containing an account of the relation existing between landlords and their tenants in respect to game, which deserves general attention, and which might be made the basis of an agreement on that subject between any landlord and tenant. "The tenant has leave to shoot over the farm," says Mr Caird, "so that he has it in his power to prevent any undue increase of game, while he has, at the same time, a personal interest in its fair preservation. An arrangement of the kind between landlord and tenant *has been found quite satisfactory;* and an instance, on a more extensive scale, on the estate where the writer has his own farm, may be mentioned to show how *easily* all cause of complaint on this head may be removed. A few years ago, on some of the farms of the Earl of Galloway, in this county, (Wigtonshire,) the ravages of game were very great, and in several instances considerable sums were paid to the tenants for the damage done to their crops. Much discontent was felt by the tenants, which *has all been removed* by the landlord giving permission to every tenant on his estates *to kill hares and rabbits,* being the description of game most injurious to crops. The *consequence has been,* that, in situations where game was excessive, it has been thinned down; but as each tenant has a *personal interest* in the matter, and can kill hares without a game license, he is careful to *prevent all trespass,* which would interfere with *his* rights, as well as those of the landlord. The expense of watching the game is saved to the landlord, the work is much more effectually done, and the result, it is believed, has in every respect been mutually satisfactory to landlord and tenant. Occasional opportunities are given at coursing matches—held by the tenants on different parts of the estates—for all classes to meet for sport during the winter, when work is slack, and no injury can be done to the crops; and the writer has on such occasions seen not fewer than two hundred people assembled—including gentry, farmers, tradesmen, and labourers—all equally interested in the chase, and *equally disappointed when there was any lack of game.* A legitimate amusement, under due regulation, is thus substituted for the pernicious system of poaching; so that, in a moral view, the arrangement has not been without its influence."—(*High Farming*, p. 21.)

Here are the practical illustrations of a system which, if generally adopted, would, we have no doubt, for ever amicably allay the heart-burnings existing between landlords and tenants regarding the destruction occasioned to crops by game; and as the tenants were the first to complain of the game, it is for them to express their desire for a similar arrangement, and the landlords everywhere will no doubt willingly respond to the request, as those have done in the cases referred to by Mr Caird. Such an arrangement would completely settle the question of the game laws, in as far as the tenants are concerned.—Ed.

THE FARMERS' NOTE-BOOK.—NO. XXIV.

Practical Ventilation; being rules and instructions of easy application for ventilating public buildings and private apartments, with practical suggestions for the cure of smoky chimneys. By R. S. Burn.—Although we do not intend to adduce many of the striking evidences in our possession, illustrative of the evil effects of foul air on the human system—still, believing as we do, that much is needed to arouse many individuals to the danger of breathing deteriorated air—we hope our short introductory remarks will prove to such of some benefit.

A large supply of pure air is as necessary for the support of life as nourishing food. This is evident when we consider the nature of air—its healthy or unhealthy action on the human frame, just as it is pure or impure in its quality. The change from pure to impure is effected by the operation, which is a constant action in the body; the result of which is a continual interchange between the blood and the atmosphere; the air receiving from the blood the carbonic acid gas, and other impurities; and the blood receiving from the air a large proportion of its oxygen, thus imparting to it the purifying and life-supporting principle. Now, when we consider that it is upon the proper action of such operations that the health of the body depends, need we wonder at the many and fatal diseases which result from the repeated inhalation of the same portion of air?

Independent, says an able writer on the subject, of the more serious evils, there are various minor evils that often prey upon the constitution when the air is of inferior quality; the long-continued action of the vitiated air gradually undermines the tone and strength of the stomach; the appetite diminishes, and the citadel or mainspring of the constitution being thus disabled or destroyed, all the other powers of the system also gradually give way.

Dr Guy states that consumption is caused in many cases amongst the poorer classes, who are confined in over-heated and ill-ventilated workshops at sedentary occupations; and he says decidedly, that he believes non-ventilation to be a more fatal cause of disease than all others put together. Dr Robinson of Newcastle says,—

Among the many diseases which have been directly traced to this source, may be mentioned typhus and other malignant and pestilential fevers—consumption, and the different forms of scrofula, disordered digestion, and nervous complaints; whilst, as a predisposing and aggravating cause of disease, its noxious influence extends throughout every variety of bodily affliction to which mankind are subject.

In addition to its influence in generating disease, defective ventilation also materially contributes to its propagation: a certain degree of concentration generally appears to be necessary for, and invariably predisposes to, an attack of fever. We could go on multiplying examples of the bad effects of foul air in the human body; but we shall refrain from further investigating this very interesting subject, and conclude our introductory remarks, by quoting the words of an eloquent writer on the subject:—

Nor is there one among the many questions thus forced upon the attention of every civilised community, which is in itself so important, or the correct solution of which is so indispensable to the preservation of health, as the investigation of the *best and simplest means* for providing, in every space occupied by human beings, a gradual but constant interchange of air. Innumerable are the catastrophes, some of sufficient magnitude to occupy the page of history, which testify to the necessity for man carrying out in his dwelling the same principle upon which nature has proceeded in the fabrication and endowment of his body. She has, by a simple and efficacious process, provided for the ventilation of his lungs; and it is for him, using the reason with which he is blessed, and imitating the beneficent provisions indicated by science, to direct through every place which he inhabits, a gentle current of that invisible atmosphere, which was intended to be the source of life, but which has hitherto been too frequently a transmitter of disease and death.

In ventilating buildings, we have endeavoured to attain to a mode not requiring expensive machinery, or complicated arrangements. Being aware that a very considerable degree of ignorance prevails as to the importance of ventilation, and that many are deterred from carrying useful plans into effect from the fear of incurring great expense, we conceive the best way to remove the prejudice, is to prove that, in the case of ventilating buildings already constructed, the expense is inconsiderable, while the incorporation of the plan with a building not executed, the expense is truly a trifle. As a fitting introduction to our rules, we propose giving a few remarks on the nature of ventilation.

Ventilation proper may be divided into two classes—artificial and natural; the former being effected by means of machinery, as fanners, pumps, screws, &c., and we may here specify fire-draught; and is divided into two modes, called the "plenum" and "vacuum" impulses—the plenum consisting of machinery for pumping or forcing air into the interior of a building, allowing the foul air to escape by openings provided for its exit; the vacuum, of machinery for *extracting* the foul, and allowing the fresh air to enter by the chinks of the doors and windows, or through proper apertures. Natural ventilation, on the contrary, does not depend on machinery for its effects; but, in the words of Dr Reid,—

It is a process by which movements are induced and sustained in the air, in the same manner as wind is produced in the external atmosphere. The specific gravity of air, when deteriorated by respiration and combustion, the two great processes which deteriorate air in the interior of buildings, is, under ordinary circumstances, lighter than that of common air; it gives way, accordingly, and is pushed upwards by the purer and denser air. Let us imagine an apartment occupied by a number of persons standing on a porous floor, and the roof taken off; at ordinary temperatures the air vitiated there by the human frame requires no mechanical power to remove it. The superincumbent pressure is diminished by the expansion induced in the air as it is heated, but the external atmosphere is permitted to have free access below as well as above to the porous floor. Its power, therefore, preponderates, and an upward movement [illegible] he necessary consequence, which is accompanied by the introduction of the fresh [illegible] the removal of the foul air. An open roof is, however, inadmissable; protection is required from the weather, independently of other arrangements; the openings must therefore be contracted, a greater velocity of discharged air must therefore be [illegible]ined. To effect this, if a shaft or box be extended from any opening near the [illegible]ing to the external roof and atmosphere, the column of warm air which soon fills [illegible] increases its power, and effectually establishes a current, by means of which the [illegible] air will be with[illegible] the body of the building.

In all cases where the nature of the building will admit of it, natural ventilation should always be adopted, it being, when once effected, completely inexpensive in its operation. Having thus avowed our preference for the system unincumbered with machinery, or having arrangements difficult to be understood by that class who will generally be found to have their management, we will now proceed to the more immediate consideration of our subject.

Air, when expelled from the lungs, after being used for the purposes of respiration, being composed principally of carbonic acid gas, one of the heaviest of our gases, it has been argued that foul air having a downward tendency, by the preponderating influence of the carbonic gas, the foul air should be extracted from the interior of the building by the *under* part, allowing the fresh to be admitted at the top. The specific gravity of common air being 1·000, while that of the carbonic acid gas is 1·527, it must be evident, say the advocates of this system, "that in a building where human beings are assembled, the carbonic acid gas *must* fall to the ground, thus forming a stratum of air which cannot possibly be removed by an upward current." Plausible as this plan seems in theory, in practice it is found altogether wrong, inasmuch as it is now established beyond a doubt, that when air is expelled from the lungs, so much animal heat is imparted to the resulting compound, (carbonic acid gas, azote, and watery vapour,) that it has an upward tendency of considerable force. A very familiar illustration of the truth of this may be found by breathing in a still atmosphere in a frosty day. The heat, which is thus derived from the body, the expelled air retains for a considerable time, but on cooling, the superior density of the carbonic gas prevails, and a downward tendency is the result. Hence the necessity for speedily conveying the foul air from the interior of the building. In practice, then, it is found that the best mode of ventilating is by extracting the foul air from the top, and admitting the fresh at the bottom of the building.

Heated air, to pass out from the interior of a building by any other course than an upward one, must be forced by currents artificially produced: the wind may sometimes be taken advantage of, but it cannot be depended upon, neither is it unvarying in intensity of action. From this will be seen the absurdity of having apertures as are often provided in the gables or ends of buildings for allowing the foul air to escape.

In ventilating buildings, two things must be borne in mind; and as upon these depend the success of the plan, particular attention should be paid to them. First, the supplying the interior with fresh air; and second, the extracting of the foul. And here attention is requested to the fact, the evidence of all experience goes to prove the truth of—that *no foul air can, by any possibility, be removed from the interior of a building, however well arranged the*

means for its exit may be, unless an ample supply of fresh air is admitted into it. On this point no mean authority says:—

A moment's reflection will satisfy the *mere* student as to the truth of the position, that unless a new portion of air be admitted into any ordinary apartment, the portion which is already there will not be expelled. It is the force of the air entering that causes the heated air to be expelled. It is necessarily impossible to have ventilation without a movement of air.

In making provisions, then, for the admission of fresh air, due regard should be had to the source from whence it is derived. If much dust and extraneous matter should be near the base of the building, the air should be drawn from a source some distance from the ground, but led by conduits in the wall (the entrance to which may be below the eaves) to the under part of the building, where it should be admitted to the interior. In buildings already constructed, forming these ventiducts would be attended with considerable expense; to prevent which, the apertures should be made at the lowest part of the base of the building, and their orifices covered with horse-hair cloth or finely perforated zinc, which will prevent the dust, &c., from entering. Should the air be admitted at once to the interior, that is, close to the walls, no ventiducts will be required; but should the air be wished to be led to the interior, say the passages of a church, or some distance from the walls, ventiducts must be employed to conduct the air to its place of exit. For this purpose metal pipes, or, what would be cheaper, wooden boxes with air-tight joints, covered externally with a composition of tar and sand, (one part of the latter to three of the former,) will be found to answer well. In the generality of buildings, as churches, &c., the fresh air should be led to some distance from the walls. In churches the passages will be the best place. The apertures for the ingress of fresh air in the passages or floors should be covered with iron gratings, with holes not larger than one inch in diameter; beneath this a plate of zinc, with perforations 120 to the square inch, and in contact with the iron grating, should be placed. These precautions being taken, the air in its passage through the apertures will be so diffused that the rush of air will be almost imperceptible. Instead of zinc, horse-hair cloth of a fine texture may be applied below the grating with advantage, especially in cases where the air supplied to the interior is loaded with impurities. The apertures for the admission of fresh air, wherever placed, should be disposed at equal distances round the building—if possible, in every wall—so that, from whatever quarter the wind may blow, an aperture may be placed so as to receive its influence. Having provided means for the admission of fresh, attention must next be paid to the extracting of the foul air. The apertures for its escape should always be placed at the highest part of the ceiling, as the air will naturally ascend there. It will be evident how much more easy it is to ventilate a church with a sloping roof ghest in the centre; the heated air will at once find its way to the

highest part, even although it should strike the galleries in its upward course. If the nature of the building will admit of it, the area of the apertures should be distributed over the ceiling in more than one place. Supposing the area of aperture of a church is required to be three square feet, if three apertures of one square foot each be placed at regular intervals in the roof, the building will be more speedily ventilated than if one aperture, of three square feet area, was alone used. In cases where there is an inner roof or ceiling, thus forming an empty space between it and the external roof, the foul air should on no account be allowed to enter into it, as by spreading itself beneath, and coming in contact with the cold outer roof, its ascending power will be diminished. The plan almost invariably carried into effect, where ventilation in such a case is attempted, of having louvres or spaces in the external roof *only* for the foul air to escape, is just as wise as if a miller, instead of leading the water from the pond to drive his mill in one large dam, endeavoured to do so by leading it in a variety of small rills or pipes, regardless of the loss sustained by friction and waste. We have even seen cases in which ventilators were fixed on the outer roof, while the inner ceiling had no communication whatever with the empty space, and the interior of the building being in fact hermetically sealed. The absurdity of this plan is so apparent that it is needless to condemn it otherwise than by the mere mention of it. It may, however, be adduced as one of the many proofs we could bring forward of the utter ignorance of many architects and builders of the philosophical principles of ventilation practically applied.

The rules for ascertaining the area of the exit-aperture or apertures for any kind of building, are as follows:—"The power of ventilation," says Tredgold, "should obviously be adapted to the greatest number of people the building is to contain at one time; and it is obvious that we had better err in excess than in deficit." Perhaps a few examples in round numbers will afford a more distinct view of the quantity of air it is desirable to change in a crowded room. According to deduction made by the same eminent engineer, four cubic feet per minute will be required for each individual. Therefore, when a room contains 200 people, there should be 800 cubic feet of fresh air supplied to the interior every minute, and of course the same quantity withdrawn. Four hundred people will require 1600 cubic feet per minute, and so on in the same proportions. As the rate of ascension of the vitiated air, in the tubes prepared for its exit, depends upon the difference of temperature of the external air, and of that in the tubes or interior of the building, the greater the difference, the greater the velocity of ascent; it follows then, that in summer it will be more difficult to ventilate a building than in winter. On the assumption that there will not be a greater difference in summer between the

external and internal atmosphere, Tredgold founds the following rule—*Multiply the number of people the building contains by four; and divide this product by forty-three times the square root of the height of the tubes, and the quotient is the area of the ventilating tube.* By the height of the tubes is meant, the height from the floor of the room to the place where the air escapes to the atmosphere. If there are more tubes than one—that is, if the area of the exit aperture found by the above rule can be conveniently divided and disposed in more than one—the different ventiducts leading from these apertures should be all of the same height, as, if not, the tall ones would overpower the short, and adverse currents would result. When the *fresh* air is led to the interior by simple apertures in the wall, their area should be double that of the foul air ventiducts; but if it is led to the passages, or some distance from the wall, in wooden boxes or pipes, these should be made of the same area as the foul ventiducts. We here give sketches and descriptions of good specimens of valves, for regulating the admission of fresh and the egress of foul air. Fig. 1, is a section of a valve, to be used when the fresh air aperture is near the ground; *a a* is the wall, *b b* an iron quadrant fixed in the wall to the end of the aperture; this quadrant has a groove or slit, as shown by the dotted line; this allows a thumb or pinching screw, attached to the hinged valve *c c*, to traverse up and down therein; the valve is moved by the handle *d*, and is fixed in any position by the thumb-screw.

Fig. 1.

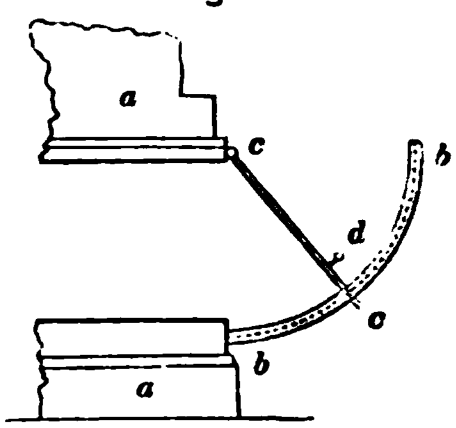


Fig. 2 is a valve for a fresh air aperture at the top of the wall, *a a* the wall, *d* the iron staple supporting a bracket for hanging the wheel *e*; this bracket is fixed in the wall, *above* the aperture and at its centre; a chain or rope *c c* is passed over the wheel or pulley *e*, and attached to the hinged valve *b*; the rope near the ground should have a counterpoise weight attached to it, to balance the valve; by a simple index, the valve can be shut to any required degree, by moving the counterpoise up or down the face of the index.

Fig. 2.

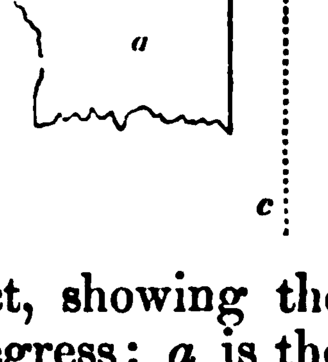


Fig. 3 is a section of part of a foul air ventiduct, showing the construction of a simple valve for regulating the egress: *a* is the ventiduct or wooden box; a board *b*, ornamented on the under part, larger in diameter than that of the ventiduct, is hung in the manner shown; *b* is the valve; *c* the rod for suspending it, sliding in, and supported by two rods or bars stretching across the box; the cord or chain passes over the two pulleys, and is produced to

any convenient part of the interior, where it should be provided with a balance-weight and index.

Fig. 3.

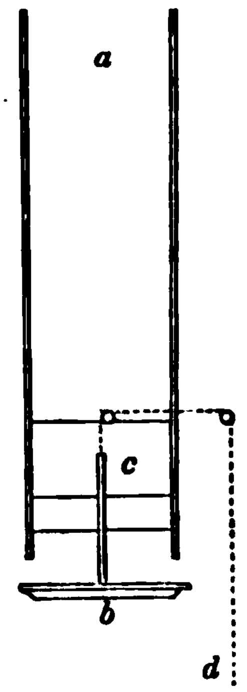


Fig. 4.

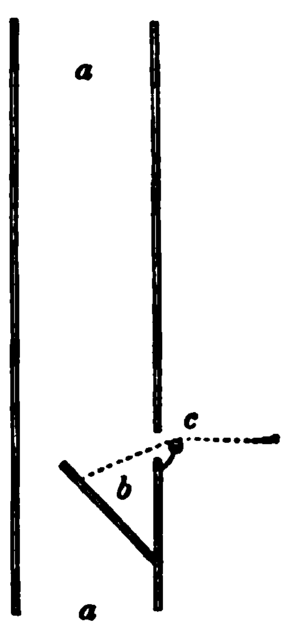
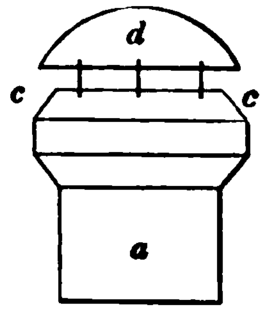


Fig. 4 is a section showing a different construction of valve: *a a* is the ventiduct; a valve, *b*, is fitted to the interior, and hinged at one side; the rope for working it passes over the pulley, *c*.

The foul air ventiducts should all be properly finished at top, to prevent the wind being blown down them. They should project above the ridge of the roof, at least 18 inches.

Fig. 5 is an elevation of a top recommended by Tredgold, which we have adopted in practice: *a* is the part for fixing it to the ventiduct; the cover, *d*, made circular or conical, prevents any down-draught, and the angular edges, *c c*, create an upward current in the tube, by the course which they cause the wind to take. The tops should be made of thin metal, and painted black.

Fig. 5.



Ventilation of private apartments.—Many plans have been promulgated in connexion with this part of the subject; but, generally speaking, they are too scientific in their arrangements to admit of their general adoption; we will therefore confine ourselves to the elucidation of those plans which are simple, unexpensive, and have been proved to be effectual.

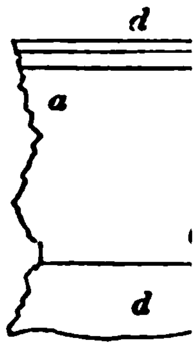
The supply of fresh air to the interior of a dwelling apartment should not depend upon such casual means for its admission as the crevices of doors and windows, but apertures of proper dimensions should be provided. The ventilators used by T. Toynbee, Esq., of London, are cheap and efficient. That used for the admission of fresh air is a plate of finely perforated zinc, having to each square inch 220 holes; this is placed in the window, in the uppermost row of squares, and the one furthest from the fire-place. The ventilator for extracting the foul air is a simple modification of Dr Arnott's plan, which we may term the "suspension valve." Mr Toynbee describes it as follows:—

It consists of a square iron tube, of from three to six inches diameter, and so long, that the outer orifice should be flush with the wall of the apartment, and the inner one enter the chimney: these tubes are usually from four to six inches in length. At the orifice entering the room, there is either a plate of perforated zinc, or a piece of fine wirework, from the upper and back part of which hangs a piece of ordinary or oiled silk, which acts as a valve, so as to allow the warm and vitiated air to pass up the chimney, and prevent any smoke from entering the chamber.

Fig. 6 will give a pretty good idea of this valve: *a a* is the ir

box; *c o* the flap or valve of silk; *d d* the wall c apartment.

Fig. (



We have been very particular in describing this plan, convinced of its great utility and value as a cheap and efficient means for ventilating apartments. The cost of the window ventilator is 2s., and of the chimney 3s.; these prices include fitting up. So much for their cheapness; as to their efficiency, Mr Toynbee makes the following statement:—

The effect on the health of the patient, I have observed, is to accelerate th and to alleviate the symptoms, so as to give great comfort to the patient; the remark that the ventilation has carried away the smells and purified the pl: am now continually applied to, by the friends of those whose rooms have beer lated, to bestow upon them a similar boon.

And here we would direct attention to a fund which has the means of doing much good amongst the poor classes; we a to the Samaritan Fund in connexion with the St George's a James' Dispensaries, which was established for the purpose o plying the sick poor with flannels and nutritious food, an *ventilating their apartments.* In the latter way, the comr have declared it to be the result of their experience, that p ventilation is one of the most important curative means. We that this institution will have many imitators throughout the cou In place of the zinc plate, in houses of a superior class, Ba transparent glass ventilators may be used with advantage.

An architect of some note communicated to the writer a pla ventilating apartments, which he had applied to gentlemen's with some success. It must, however, be incorporated wit building when first constructed. At the ceiling of the apart above the cornice, he makes a narrow opening; this commun with a channel formed between the lath and plaster, and the l on which the laths are nailed. The foul air is led to aper formed on the outside walls beneath the eaves, thus affordin it a clear escape from the room. The fresh air is admitte openings made in the walls beneath the windows, communic with holes made in the skirting of the room, or in the floor; i latter case, the carpet covers the apertures, and serves to diffu air. In this plan, each room must have an independent chanr the escape of the foul air.

As in many cases the poorer classes shut up the ventilator pressed with the absurd idea that they are dangerous, Wi Hosking, Esq., proposes the following plan to be adopted, v cannot fail to be effectual:—

A sweet-air flue should be made within the outermost jamb of every cl breast, from the bottom to the top, and opening into the outer air free from a munication with the smoke flues, and not liable to be contaminated by them. should open out at the lowest level again, either directly under the floor, c horizontal flue with a grated mouth, so that it may be fed with air from both

Every fire should be fed, by an opening from such flue behind the cheeks and back of the grate, with the fresh air, perforations underneath the grate admitting it to the fire, and other perforations to the room generally. Ninety-nine out of a hundred of the poor would never suspect the mode of access of the outer air, and they would breathe fresh air in spite of themselves.

As a means for withdrawing the foul air, the suspension valve should be used. We do not agree with Mr Hosking that the current of air established near the fire-place, by the action of the draught, would effectually draw off all the foul air from the room. This is contrary to general experience; moreover, it would not be desirable to put it in operation. Were such a plan available for withdrawing the foul air, one bad effect of it would be the drawing of the current of foul air past those sitting round the fire-place.

Having thus briefly described efficacious and easily attainable modes of ventilating apartments, independently of all casual means, we would, in conclusion, recommend every one, in addition to adopting these plans, to ventilate their apartments by opening on every possible occasion their doors and windows. The currents produced by such means are health-giving and health-restoring draughts. There is much nonsense promulgated about the danger of draughts. We have many a day sat in a thorough draught, even in the depth of winter, and never yet caught cold. Many are in the habit of doing so likewise. In India, draughts, the very life of the inhabitants, are artificially produced. We do not assert that sitting in a draught is fraught with no danger in some cases; with the habit of living in close, confined, over-heated apartments subject to no current, no wonder that many catch cold on being exposed to a draught. In reference to this subject, Dr D. B. Reid says—

It would be well for those who suffer from draughts and currents, and who constantly declaim against any movement of air, to consider that their bodies have been so formed that the air never stagnates round them during life; that a slow but equal and continuous current ever moves around the living frame; that it is not the mere movement of air which is the cause of offence, but the movement of air in proportions of a character uncongenial to the condition of the system at the moment; that even the most delicate ladies, who express their horror of draughts and currents, practically increase from time to time the movement of air that impinges upon them in warm atmospheres with their fans, producing an agreeable and refreshing atmosphere with air which is oppressive and offensive, when not assisted by their inordinate movement.

But though advising all to air their apartments well, by opening doors and windows, we would at the same time earnestly recommend every one, as they value their health, to have a plan of ventilation, independent of all such casual means, instantly carried into effect. A few shillings can never be better spent. We know of people travelling to far distant countries to gain health by change of air, ignorant of the fact, that by the judicious expenditure of a few shillings, they would have found it nearer home—nearer than they could well anticipate. A walk in a gentle breeze will often cure a headache, a window drawn up and a door opened, the same effect will often be obtained. Not taking into account the injurious effects

of foul air in the body, we cannot conceive, even as a matter of taste, how people should be found to prefer foul and fœtid to the sweet air—

> That trembling floats from hill to hill,
> From vale to mountain—with incessant change
> Of purest element.

We will close this part of the subject by expressing our hope, that our remarks will tend in some measure to direct more particular attention to this important subject of domestic ventilation.

A smoky chimney has been well characterised as one of the most annoying of our house discomforts. Annoying as it undoubtedly is, it is matter of astonishment that, with one or two solitary exceptions, no really successful remedy has ever been applied to overcome it. However, our surprise is considerably lessened, when we consider that the generality of individuals who have directed their attention to the subject, have been utterly ignorant of the philosophical laws which regulate the movements of heated air. Neglecting or entirely overlooking the study of these, they have depended upon various plans and machines for effecting a cure, the most of which have been constructed in complete defiance to all natural laws. It is matter of regret, that scientific men should have so long considered this subject beneath their notice. We free them from the imputation of inability to cope with its difficulties, but we blame them for their indifference, more especially as, by turning their attention to the subject, they would not have compromised their professional dignity, which we suspect they were afraid of doing. Of late years, however, we have seen engineers and scientific men, high in their respective professions, who have not thought it unworthy of their professional attention.

From the result of some experience in the observation of cases, and from long-continued study of works on the subject, we humbly conceive that the key to the solution of the difficulty of curing smoky chimneys, lies in the proper application of a fact, the axiomatic truth of which the result of all experience goes to prove, independent of its theoretical accuracy—that *heated air cannot ascend a flue or chimney, with force sufficient to overcome opposing currents, unless a due supply of fresh air is supplied below, at or near to the fire-place.* Those acquainted with natural philosophy will recognise in this a modification of the well-known principle of impenetrability. Now, by the proper application of this principle, we do not hesitate to say, that any chimney, however bad, will be effectually cured; so unvarying is it in its operation, that whenever a chimney smokes, we may rest assured that the supply of air is deficient below—that some opposing current has overpowered the ascending smoke and heated air. We do not remember of ever seeing a case in which the opening of a door or window did not restore the *natural* current, and cure the smoke. Had the course of the air admitted by the door or window been traced, it would in

every case, without exception, have been found rushing directly to the fireplace. Many rooms smoke on account of the air therein being drawn therefrom, to supply a larger fire in another apartment not properly supplied with air: were the two rooms supplied independently of each other with a sufficiency of air, the chimneys in both rooms would draw well without smoking. We know of one instance in which almost all the chimneys in one house smoked; the course of the current was examined, and it was found that a large stove in the laundry actually drew its supply of air from the fires below, through the medium of the staircase. The laundry after this being well supplied with air, the other chimneys ordinarily drew well. A fire which has been in operation all day in a sitting-room, in the same floor with a drawing-room, has overpowered the newly kindled fire in the latter, by drawing the air therefrom for its supply; the newly assembled visitors have been obliged to vacate the apartment. A person at all acquainted with the subject would have at once discovered the cause, and by the opening of a door or window in the sitting-room, through which a supply of air could have been obtained independent of the drawing-room, the difficulty could at once have been obviated. In this case, the sitting-room fire habitually drew, when its doors were shut, its supply from the drawing-room. We could cite numerous examples of the truth of our principle, but we do not consider it here necessary. Having drawn attention to the fact, we doubt not that all observations hereafter made will corroborate its truth. We will finish our remarks by giving our practical rules and suggestions, so as to admit of parties taking advantage of our plan. The course of the current in a smoky room must first be found; this will best be done by taking a small taper or a piece of smouldering brown paper emitting smoke: by holding this quietly in the room, the direction the flame or vapour takes is that of the current of air: if it leads to the fireplace of a stronger fire in another apartment, rest assured this derives its supply from the room smoking; supply the room with the strong fireplace with air by means of the following plan, and the room will smoke no longer. But to every room in a house would we recommend the following plan to be carried into effect, whether such rooms be smoky or not, whether they smoke by supplying fires in other apartments, or by opposing currents caused by wind forced down the chimney.

From the open air lead a pipe, varying in size according to the size of the room or grate, (not less than two inches in diameter for a bed-room grate,) from a hole made in the wall to the space beneath the hearth-stone, immediately below the space where the fender usually stands; let an orifice be made in the hearth-stone, above the termination of the fresh air pipe, covered, if so wished, with a small iron grating; let a few apertures be made in the fender, or louvre-shaped openings may be substituted in the place of

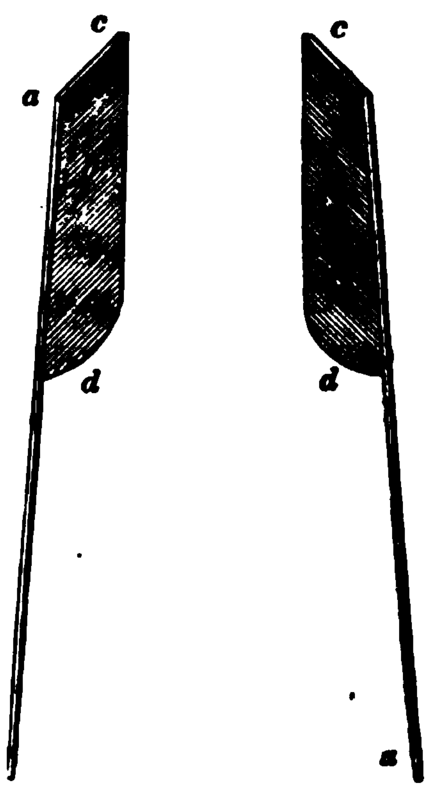
holes, to prevent dust and ashes going into the air aperture in the hearth-stone. The ventilating grate recommended by Wm. Hosking, Esq., previously mentioned, may be used with advantage, instead of the plan we have here given—ours is much more simple, and easily carried into effect. Better err in making the pipe for supplying the air too large than too small; the fire will take no more air than it actually requires; the surplus, if any, will supply the inhabitants, if the room is supplied with a foul air extracting valve.

Chimneys smoke very frequently by being made too large in the interior, (indeed all are made at hap-hazard); in such cases the heated air is often found to be ascending by one side, while the fresh air is actually coming down the other to supply the fire: consequently, the ascending column of heated air being considerably cooled, any opposing current has a great effect in retarding it; hence, such chimneys invariably smoke in high winds. Chimney-flues should not be made larger than is absolutely required for the exit of the heated air. There are rules for calculating the sizes, but we do not conceive it necessary to give them here. A very absurd practice obtains amongst many practitioners, of contracting the orifice of the chimney at the bottom nearest the fire-place: "It is like," says Tredgold, "contracting the aperture of a pipe which supplies a jet." Chimneys, to go well, should be contracted at top; we give the following rule for ascertaining the required degree of contraction:—

Let 17 times the length of the grate in inches be divided by the square root of the height of the chimney in feet, and the quotient is the area for the aperture at the top of the chimney in inches. I had a grate of 15 inches, with a chimney 36 feet high, to which the contracting top was to be fixed—$17 \times 15 = 255$—and the square root of 36 is 6, therefore $255 \div 6 = 42\frac{1}{2}$ inches for the area of the top, and the diameter of a circle $42\frac{1}{2}$ in area is nearly $5\frac{1}{2}$ inches.

Figure 7 represents the mode of contraction; *a a* is the chimney-can; *b b* the iron part for contracting; the bottom part should be rounded as at *d d;* the parts *c c* should be made angular, as shown; the angular faces facilitate the passing of the wind over them. Chimneys sometimes smoke in particular winds; this is caused by the wind striking on some particular part of the adjoining house, or the chimney-stalk, of which the chimney forms itself a part, or by being projected along or across the roof in a peculiar way, causing a descending current in the chimney. This difficulty may be obviated by contriving and fixing a cap or cowl so designed, that the apertures for the escape of the smoke may be turned away from the quarter in which the chimney smokes. The top represented in (fig. 5.) has been adopted with great success

Fig. 7.



in blow-downs. As a really efficient cap or top, we can earnestly recommend Kite's (of London) Diamond Deflecting Chimney-top. It has been adopted by the Honourable the Commissioners of Woods and Forests.

While recommending the plan of contracting the chimney-top, in accordance with Tredgold's rule, as a great conducive to a chimney-flue working properly, and the adoption of properly contrived cowls or tops in cases where wind creates opposing currents, we are decidedly of opinion that no chimney can be insured to draw well, at all times and in all circumstances, unless a due supply of fresh air is provided below; and that for economy and certainty of success, the best mode of supplying that air is by leading it in pipes or conduits from the open air, so as to be independent of all other sources.

We trust that the suggestions and rules we have given will be found to be of some practical use. To the subject of ventilation we may return in a future Number; if so, we will consider our principles as applied to farm-buildings, stables, cow-houses, drying of grain, and other important purposes.

On Useful Insects and their Products. By JAMES H. FENNELL, Author of "A Natural History of Quadrupeds," &c.—V. *Lepidoptera.*—In China we find every member of the dense population of that widely-spread region, from the emperor on his throne to the peasant in his lowly hut, indebted for his clothing to the labours of a caterpillar. It is probable that the Chinese were the first to apply silk to useful purposes; as the silk-moth, *Bombyx mori*, whose caterpillar is objectionably called the silk-*worm*, is a native of their country. They say that they first began to use it about two thousand seven hundred years before the birth of Christ. In the time of the Tsin and Han dynasties, letters were written upon silk cloth; hence the characters for silk and cloth are component parts of the characters indicative of paper. In the time of Ho Te, (A. D. 100,) Isaac Lun began to take old silk of different kinds—fishing nets, and hemp, and the bark of trees—and boil them to rags to make paper of them; and which was used throughout the whole of the empire. To the present day, in China and Tartary, paper is manufactured from the refuse silk. Mr Reeves states, in some parts of China, silk-worms' cocoons are used for the same purpose.

The culture of the silk-worm, passing through the intermediate nations, was received from the Chinese by the Persians; and the Greeks learnt its use from the latter, in the war of Alexander, but not the modes of producing and preparing it. At first they supposed it was composed of the thread of a species of spider, which spun it about the branches of trees, off which it was collected. Virgil is the earliest Roman writer who is thought to allude to the

production of silk in China; and if he really does so, the terms he employs show how little was then known at Rome of the real nature of the article:—

> Velleraque ut foliis depectant tenua seres.
>
> *Georgics*, lib. ii. l. 121.

But, as M'Culloch observes, it may be doubted whether Virgil does not in this line refer to cotton rather than to silk.* When the rest of the arts passed from the Greeks to the Romans, they received that of manufacturing silk likewise, in the imperfect state in which Greece then possessed it. Silk was brought to the Romans in the year of our Lord 274, from Serica, in India, of which place the silk-worm is a native. It was a scarce commodity among them for many years, and valued at its own weight in gold. We need not, therefore, wonder at the statement of Vopiscus, who relates that the Emperor Aurelian, who died A. D. 275, refused to treat his empress to a silk robe, the price of which was further enhanced by its being purple. During the reign of the Roman emperor Tiberius, a law was made in the Senate, forbidding men to disgrace themselves by wearing silk, which was only fit for women; and so ignorant yet were Europeans of its nature, that it was then supposed to grow upon trees like cotton. Heliogabalus is said to have been the first person who wore a *holosericum*, a garment entirely of silk. The Greeks of Alexander's army are said to have been the first who brought wrought silk from Persia into Greece, about three hundred and twenty-three years before Christ; but its manufacture was confined to Berytus and Tyre, whence it was dispersed over the west. At length, in the time of Justinian, in 555, two monks coming from Cerinda, in the East Indies, to Constantinople, brought with them great quantities of the silk-moth's eggs, and having hatched them, they fed the caterpillars with mulberry leaves, and by proper management they rapidly multiplied to such a degree, that silk manufactories were erected at Constantinople, Athens, Thebes, and Corinth. The Venetians, soon after this time commencing a commerce with the Greek empire, supplied all the western parts of Europe with silk for many centuries. The demand for silk from the East diminished of course. The Greeks were no longer obliged to have recourse to their enemies, the Persians, for a supply of it; and a considerable change took place in the nature of the commercial intercourse between Europe and India. The culture of silk was not introduced to Sicily till the year 1130, in the reign of Ruger, who afterwards introduced it to his newly acquired kingdom of Naples; whence it was adopted in Italy, Spain, France, and Prussia. In all these places extensive manufactories were established, and carried on with silk of domestic production.

* M'Culloch's *Dictionary of Commerce*. See also a note to Stawell's translation of Virgil's *Georgics*, 1808, p. 364.

In 1327 the authorities of Modena drew a revenue from the rearing of silk-worms, exacting that the proprietor of every enclosure should plant at least three mulberry trees, and that all the cocoons produced should be publicly sold in the market, the buyer and seller paying each a tax to the government. From Modena the rearing of silk-worms spread to other parts of Italy. Other countries, too, made attempts to naturalise the silk-worm. In France, Louis XI. caused the establishment of plantations for this purpose. In 1521, the French commenced a silk manufacture, but it was a long time before they could obtain raw silk of home production—and even in 1547 silk was scarce and dear in France. By the time of Henry IV., the mulberry tree and the silk-worm were located in Lyonnois, Dauphiné, Provence, and Languedoc. The latter monarch extended the same system to the neighbourhood of Orleans, gave honours and dignities to the successful cultivators, and even directed his own attention to the rearing of silk-worms, at the Tuileries and Fontainebleau. It was found, however, subsequently, that none of the attempts to rear silk-worms in the northern parts of France were permanently successful; the quantity or the quality, (or both,) being insufficient to render the attempt profitable. For the last century, the only parts of France where the rearing has been carried on, on any considerable scale, are the sunny regions of the provinces bordering on the Mediterranean. To induce the peasantry of these provinces to direct their attention to this subject, Colbert, the minister of Louis XIV., established nurseries for mulberry trees, and presented the young trees to any peasant or farmer who wished to rear silk-worms. He also gave a reward of three livres to the cultivator, for every tree that should be found in a flourishing condition three years after it had been planted. Since this period the French have succeeded in the culture of silk-worms on trees exposed to the weather. In April 1761, a French cultivator placed twelve hundred silk-worms, just past their first moulting, on some espalier mulberry trees, and let them remain there exposed to the season, which was very cold in the beginning, and afterwards very stormy. They suffered, however, neither from cold, wind, rain, heat, thunder, nor were they attacked by any disorders, and it did not appear that the birds destroyed many of them. Five hundred and fifty cocoons, weighing two pounds and a half, Lyons measure, yielded about three ounces of the finest silk ever obtained in France; only one cocoon was faulty, but none double, so that the operation requisite to wind off the silk was not attended with any waste. This method, therefore, appeared on calculation more advantageous, in regard both to the quantity and the quality of the silk obtained by it, than that usually followed of feeding them within doors. Eventually, Italy and France have become successful competitors in silk culture with China and the East Indies. The culture of silk has been attended

with success as far north as Prussia since the year 1760, when Frederick the Great issued an official order for increasing this department of husbandry in his kingdom, in which the mulberry endures the severest winters without injury.

The Americans have attended to the culture of silk for nearly a century. It was a production of Georgia as early as 1755. Silk is yielded to some extent in both North and South America, the home produce being wisely encouraged by government. The climate of the United States being quite congenial to the mulberry tree, silk-worms thrive equally well in Massachusetts, Connecticut, and other parts of New England, as in France and Italy. According to a report in Congress, the quality of the American silk is equal to, if not better than, that produced in any other country. While twelve pounds of French and Italian cocoons are required to produce one pound of raw silk, only eight pounds of American cocoons are necessary to yield the same quantity. In 1840, Mr Rhegni had four hundred thousand mulberry trees growing in his silk grounds at Germantown, near Philadelphia, and on which he fed, during that year, two million silk-worms. He was then about planting sixty more acres, and calculated on feeding fifteen million silk-worms in two years from that time. The silk-worm cultivated in the vicinity of Candahar by the Affghans is, without doubt, an importation from China, notwithstanding their assertion that both the insect and the mulberry tree are indigenous to the Hazareh hills; whence, they say, both were brought to Candahar. Captain T. Hutton, of the Indian army, thinks that if the tree and insects were really brought from those hills, they must have been carried there from China in early times, and the former must have been cultivated merely for the value of the fruit, which is extensively eaten by the people of those hills. Affghanistan produces five species of mulberry, of the black, red, and white kinds; two sorts being chiefly cultivated for the silk-worm, the others merely to supply fruit to the people. Two sorts of silk-worm are known to the Affghans—the larger one evidently the Chinese species, the smaller probably a degenerate species, which is cultivated only by a few poor villagers, who cannot procure the other sort. The system of culture differs little from that which is adopted in other parts of the world. The general mode of hatching the eggs is by enclosing them in little bags, which are carried close to the body for two or three days, when the animal heat discloses them. The silk-worms are usually kept by the villagers until they have formed their cocoons. The trees cost sixpence each, upon an average, and the cultivators provide five hundred trees for every *seer*, or two pounds' weight of eggs, which costs two pounds five shillings. The live stock from these eggs requires the attendance of about fifty men, who are paid each from seven shillings and sixpence to twelve shillings per

month; and the time consumed is nearly two months. The cultivator sells the cocoons to the spinner at sevenpence to eightpence halfpenny per pound weight. The spinner furnishes the raw silk to the manufacturer at eighteen shillings and ninepence to fifteen shillings per pound. The cost of reeling is three shillings and ninepence per pound. The seer of eggs, if carefully cultivated, yields four thousand eight hundred pounds' weight of cocoons, which are reduced two-thirds by the drying up of the pupa within them. Each seer of dried cocoons yields six ounces of silk; so that a seer of eggs produces three hundred pounds' weight of raw silk, the sale price of which varies much, but may reach to even ten thousand pounds sterling. The outlay for this quantity is less than five thousand pounds sterling, including the purchase of eggs, the cost of trees, wages of attendants, and the expense of reeling. In making the above calculation, it is supposed that the trees are purchased, and the silk reeled by hired workmen; but if the cultivation were undertaken by the British government, plantations might be made on the waste land, which abounds everywhere at Candahar, and a superior machinery for reeling would of course be employed, which would very much raise the rate of profit, and very probably improve the quality of the silk. The spinners in Affghanistan make advances to the cultivator, and receive a large proportion of the produce in exchange. Owing to recent destructive events, the trade and culture have been so greatly disturbed that, in May 1840, there were but two spinners employed in Candahar, and they were not in full work; and, according to Captain Hutton's last inquiries, no more than forty pounds' weight of eggs could be reared within ten miles of Candahar, there not remaining trees enough for more than that quantity. It is singular that the silk culture has not been undertaken in the Antilles, instead of leaving this enormous trade in the hands of the Asiatics. Spix says, that in the capitania of St Paulo in Brazil, the bishop, Don Mattheus de Abreu Pereira, used to amuse himself in his garden in breeding silk-worms, which readily multiply there, and produce an extremely beautiful thread. As the mulberry tree comes to great perfection in that climate, it may be confidently expected that the silk culture will be carried on there with great success. At St Helena, where the mulberry tree thrives well and luxuriantly, there was, in August 1827, two hundred and eighteen thousand silk-worms in very healthy condition, and about to commence spinning. In that year, the first perfect specimen of raw silk produced on that island arrived in England, and was found to be of very fine quality, and entirely free from any disagreeable odour,—a circumstance much in its favour. M. Valliere, who observes that the system of mulberry planting adopted by the English in their extensive mulberry orchards on the borders of the Ganges, and by the Chinese, as well as the people of the United States, would be

highly beneficial to France, says that the climate of Africa offers every resource to European industry and agriculture, as it not only produces grain, trees, plants, and rare flowers, but opens an astonishing enterprise for the breeding of silk-worms, as the country abounds with mulberry trees of a superior growth, that only want the hand of the horticulturist to render them highly lucrative. The mulberry trees are, at present, however, planted there a little too late. They, as well as other trees, should be planted before Christmas, so that they may derive the benefit of the winter and spring rains. The mulberry tree of the Philippine Isles is thought the best for the feeding of the silk-worm, which it enables to produce a superior kind of silk, which can be drawn to the finest degree, and is much greater in weight and quantity. It may be accepted as a general rule, that wherever the mulberry tree will grow, which is the most beneficial food for the silk-worm, there silk may be produced, and of a finer quality, than when any other diet is given to these insects.

Numerous attempts have been made, from time to time, to introduce the culture of the silk-worm in the British islands, as a branch of husbandry. The success which attended the establishment of mulberry plantations in the south of France, induced James I., in 1608, to entertain the hope that results as favourable would follow if the experiment were tried in England. After announcing to the people, that "in a few years' space our brother the French king hath, since his coming to the crown, both begun and brought to perfection the making of silk in his country, whereby he has won to himself honour, and to his subjects a marvellous increase of wealth," James promulgated his opinion, that "from the experience of many private persons, who had bred silk-worms for their pleasure, nothing had appeared to cause a doubt that these may be nourished and reared in England, provided there were a sufficient number of mulberry trees to supply them with food." Further to promote his object, he sent circular letters to all the counties of England, strongly recommending the inhabitants to plant mulberry trees. He requested the receivers of these letters to take the opportunity, at the holding of the quarter sessions, and at any other public meetings, of persuading and requiring those who were able, to buy and distribute in the counties the number of ten thousand mulberry plants, which were to be procured in London at the rate of three farthings per plant. The public feeling was at first averse to the novel undertaking; but the continuance of the royal sanction and support, and a consideration of the advantages reaped by other European nations from this source, seem, from some of the king's speeches in the year 1620, to have at length engendered a growing interest for the subject among the people in general. By the time of Charles I., however, the cultivation of the mulberry and the rearing of silk-worms appear to

have been almost abandoned; but still mention occurs of a grant made, in 1629, to Mr Walter Aston, of the custody of the garden, mulberry trees, and silk-worms "near St James's, in the county of Middlesex." From a notice of this garden in Evelyn's *Diary*, and Pepys' *Diary*, the latter written not long after the Restoration, the mulberry garden seems to have become merely a place of gay resort. In 1703, when John Duke of Buckingham erected Buckingham House, he attached the mulberry garden to it as private property. The present Buckingham Palace stands on the spot which the mulberry garden occupied. The attempts which have been made to naturalise the silk-worm in England by King James, Mr Walter Aston, Mr John Appleton, the British Silk Company, Miss Rhodes, Mrs Williams, Mrs Allen, Mademoiselle Coge, and others, are highly laudable, because if it could be made a profitable employment for country persons, much good might result therefrom. Some of these experimentalists fed the silk-worms on lettuce-leaves only; others began with lettuce-leaves, and afterwards gave the insects a portion of their favourite food; some had warm buildings constructed purposely for the reception of the silk-worms: others devoted unremitted personal attention to their little charge; but none obtained any very promising results. In 1718, a patent having been granted to Mr Appleton for rearing silk in England, he established a joint-stock company, whose shares were sold at £5 each; obtained a deed of trust, which he enrolled in the Court of Chancery; and caused the necessary directors to be chosen for carrying out the project. The company then took a lease, for one hundred and twenty-two years, of a plot of ground near Chelsea, and immediately planted two thousand mulberry trees. One of the shareholders, Mr Barham, wrote an essay predicting that the undertaking was sure to prove a mine of wealth to the proprietors; but the whole affair seems to have fallen to the ground a year or two afterwards, along with other commercial speculations of the same period. In the interval of more than a century between the years 1718 and 1825, repeated attempts were made to bring this branch of industry to a profitable issue in England, aided frequently by the encouragement and premiums of the Society of Arts; but all these instances were unattended by the great test of success—commercial profit. In the last-mentioned year, when companies were established as plentifully as in 1718, a British, Irish, and Colonial Silk Company was formed, not, however, wholly from a wild spirit of speculation, but from a benevolent desire, on the part of some of its supporters, to improve the condition of the Irish peasantry, by increasing their sources of profitable industry. Eighty acres of ground were purchased in the county of Cork, in which were planted four hundred thousand white mulberry trees. Buildings were erected for carrying on the whole routine of operations connected with the production of

silk, and the whole placed under judicious arrangement. The same company also purchased a piece of ground near Slough, and planted it with eighty thousand mulberry trees. But these attempts proved unsuccessful, and were subsequently abandoned. Bertizen produced good cocoons somewhere near London in 1790, and the silk reeled from them obtained the premium of the Society of Arts. About twenty years ago, that Society presented a large silver medal to a lady for a specimen of silk produced in England. The silk-worms, in this case, were fed on the common cabbage-lettuce till the last time of changing their skin, when they were put on mulberry leaves until the time of spinning. A London manufacturer, to whom the silk was submitted, found some of it equal to the finest Fossombrone silk, and worth a guinea per pound; while other portions were equal to the usual qualities of silk produced in Naples, Bergamo, and Milan. Mrs Whitby of Newlands, near Lymington, having heard that an English gentleman had doubled his capital in three years, and was receiving ten per cent profit by a silk-growing establishment near Milan, resolved to repeat the experiment on her own estate in England. Being satisfied that the climate here is equally favourable to the growth of the mulberry, she imported, in April 1836, from a nursery garden at Turin, one hundred standard and one thousand dwarf Philippine mulberry trees, (*Morus multicaulis.*) The latter sort appears to be preferable, producing much larger leaves than the Italian wild white mulberry, or that which in England is cultivated for its fruit. Its growth is rapid, and it is easily propagated by cuttings, which strike as readily as the willow. Treating them according to the directions given in M. Burden's book, she did not lose one; indeed, she gathered leaves from them the same year. A scarcity of leaves will happen occasionally in dry seasons, but this is no proof that silk culture cannot succeed, as every produce on the face of the earth is liable to fail at times. Having bought half an ounce of the silk-moth's eggs at Novi, which is said to produce the best silk in Italy, Mrs Whitby thus laid the foundation of her small establishment. The eggs can always be retarded, so as not to be hatched before the mulberry is ready to put forth sufficient food. In France and Italy the hatching begins about the 1st of May; but Mrs Whitby found a month later preferable. All the books she had consulted described a temperature of seventy-five degrees to be essential; but eight years' experience taught her that the silk-worms thrive better at a much lower temperature. Ventilation is more necessary than extreme heat. In damp or cold weather, she regulates the temperature to from sixty-five to seventy degrees, by means of a very small Arnot stove, the expense of which is trifling—as, indeed, is everything connected with the cultivation of silk. She reared her silk-worms, without any difficulty, in an old loft. They were exempt, too, from the diseases which

sometimes carry off whole colonies in Italy; and their cocoons were pronounced good, and would bear a comparison with the Italian specimens she had brought over with her. In an unused stable she had placed an Italian silk-reel; but at first she found insurmountable obstacles in winding off the silk fit for the loom. She tried year after year in vain; for though her silk was beautiful to look at, a London firm pronounced it to be "of good quality, and sufficient bone and brightness, but the winding wanted a certain peculiarity necessary for the loom." This opinion encouraged her to send to France for a person acquainted with the process. She accordingly received into her establishment a young French girl, who brought with her a different sort of wheel, which proved to be cheap, simple, and effectual, accomplishing the task so easily, that three of the household could wind with facility, besides a cottager's wife, who was employed to attend upon the silk-worms. At length Mrs Whitby obtained silk of as good a quality as any we receive from France or Italy, which fact was attested by several eminent manufacturers in London, Manchester, and Coventry. Her silk was worth as much in the market as the best foreign silks. She presented to the Queen twenty yards of rich and brilliant damask, manufactured from silk raised at Newlands. After making allowance for occasional unfavourable seasons, labour, machinery, outlay of money, &c., it would be found that land laid out for furnishing food for silk-worms would afford a large profit.* In 1838, Mr Beck, coachmaker, of Dumfries, Scotland, had several silk-worms living, well and active, on the branches of a mulberry tree growing in Terraughty Wood.† In 1839, Mr William Felkin procured the eggs of the silk-moth from Italy, and hatched and nurtured about ten thousand caterpillars in a warehouse in the centre of the town of Nottingham, keeping the temperature of the room low, at seventy, or not more than seventy-five degrees. Some of them he fed at first upon lettuce leaves, the others entirely upon mulberry leaves. None of them spun till eight weeks old; but those originally fed on lettuce did not spin until those fed entirely on mulberry leaves had done spinning, the latter setting about it three weeks before the former. Contrasted with some of the same year's produce received from Milan, Mr Felkin's cocoons were but slightly inferior in size, weight, or compactness. They weighed at the rate of three hundred to a pound, being lighter than those of France or Italy, the best of which weigh two hundred and fifty to the pound. Mr Felkin's experiments satisfactorily proved that silk of the best quality can, with proper skill and attention, be produced in England. Mr Heathcote, of Tiverton, made some silk net from Mr Felkin's raw material, which was found to answer extremely well. Mr Felkin remarks, that whatever may be the opinion as

* Whitby's *Manual for Rearing Silk-Worms in England.* 1848.
† *Dumfries Courier*, July 1838.

regards the profitableness of the silk culture in England, or even in Ireland, it is unquestionable that it could be profitably conducted in the West Indies, and in our new colonies in the Pacific. He asserts that in Hindostan the cultivation of silk might be greatly improved in quality, and indefinitely increased in quantity, by proper enterprise and attention. Labour is there cheaper than anywhere else, and there is plenty of unoccupied and waste land perfectly suitable for the mulberry; so that if, instead of the cultivation of the silk being, as at present, confined to the marshy delta of the Ganges, the superior kinds of silk-worms and mulberry trees (so long grown in the south of Europe, and recently in the United States of North America) were introduced into the more elevated and even mountainous parts of Hindostan, &c., the whole world might be supplied with raw silk from India at half its existing cost,—which cost is now augmented by the demand greatly exceeding the supply; so much so, as to have compelled us to pay four, instead of only three millions a-year, during some years, for the same weight of material, and thus greatly to limit the extent, and even to risk the safety, of the silk manufacture itself.

Since the legalised importation of foreign manufactured silk, the British manufacture has made a more rapid progress than it did during the whole preceding century, when it was subjected to the trammels of monopoly and prohibitory laws. The Coventry weavers have made so very marked an improvement in their art, that some of the most eminent manufacturers declare that they should, at this day, disown the work which even their best hands used formerly to furnish; that now their patterns and productions are fully equal to those of their foreign rivals, and qualified to come into successful competition with the most beautiful ribbons wrought by the Lyonnese weavers. After the repeal of the prohibition, we find that the quantity of raw and thrown silks imported into Great Britain amounted, in 1829, to 2,892,201 lb. Later still, in 1847, it amounted to 4,444,960 lb. At present, the value of the silk brought to this country exceeds £2,000,000 annually.

There seems to have been a company of silk-women in England so early as the year 1455; but these were probably employed in needleworks of silk and thread. Italy supplied England with the broad manufacture till 1489. In 1620 the English commenced the broad manufacture. The number of refugees who, on the occasion of the edict of Nantes in 1635, fled from France to England, carrying with them their skill and industry, greatly promoted the British silk-manufacture; as did also the silk-throwing machine erected by Sir Thomas Lambe, at Derby, in 1719, which, moved by a water-wheel, could work, in a day and night, 318,504,960 yards of organzine silk. In 1661, the company of silk-throwsters employed above 40,000 persons. The art of knitting silk stockings was first practised in Spain; and in 1589, twenty-eight years

after it had been introduced into England, Mr Lee, of Cambridge, invented the engine, or steel loom, called the stocking-frame, by means of which England was enabled to export great quantities of silk stockings to Italy and other parts. Aubrey relates that Sir Christopher Wren proposed to the silk stocking-weavers of London a way to weave seven or nine pair of stockings at once, (it must be an odd number.) He demanded £400 for his invention; but the weavers refused it because they were poor, and besides, they said, it would spoil their trade, not considering that light gains, with quick returns, make heavy purses. Sir Christopher, seeing they would not adventure so much money, broke the model of the invention all to pieces.

The great success of the silk culture in China may be chiefly ascribed to the fact of the mulberry being a native of that country, the soil and climate of which is better adapted to its growth. For any success to attend experiments in this culture in Britain or elsewhere, it is necessary that the mulberry trees should be in leaf at the time when the silk-worms are hatched. This is the case in warm climates; but in England the one event often precedes the other. Mrs Whitby, however, has demonstrated the possibility of obtaining a sufficient quantity of food at the proper time. Dr Bellardi, in a work published at Turin in 1787, proposed a method of drying and powdering mulberry leaves in such a manner as to allow of their being kept through the winter in sufficient preservation to feed the early silk-worms, so frequently hatched before young leaves appear. Bertezen objects that these pulverised leaves would enter into a state of fermentation when moistened, as they must be, and placed in the usual temperature for silk-worms, 70° of Fahrenheit. He contends also that the leaf of the black mulberry is preferable to that of the white.* That the leaves of the white mulberry are, as he admits, the more early of the two, is however strongly in their favour; nor is there any obstacle to this kind being cultivated in England, as it grows very well here, and even in Sweden. Professor Balfour thinks that the Philippine mulberry might grow all over England. Mr Felkin says, that silk-worms fed entirely on mulberry leaves, invariably exhibit from forty to forty-five beats a minute in the pulsation visible along the back, whereas those which are fed on lettuce leaves, have their pulsation reduced to twenty-five or even to twenty beats a minute. The Rev. Mr Swayne fed one herd of silk-worms on black mulberry leaves, another on white mulberry leaves, and a third on lettuce leaves; but the result showed that none of them yielded such a quantity of silk as is generally obtained in Italy, and that those which had been fed on lettuce

* S. Bertezen's *Thoughts on the Different Kinds of Food given to young Silk-worms, and the possibility of their being brought to perfection in the climate of England; founded on experiments made near the Metropolis,* (1789.)

leaves yielded decidedly less than the others. It is well known that a species of silk-worm accustomed to one kind of food, will not very readily partake of another. Thus while the Indian silk-worms will feed on the jujube, castor-oil plant, and several kinds of laurel, the Italian silk-worms will not pasture upon those plants. Mr Felkin states that, in his experiments, silk-worms that had been fed on lettuce leaves died rapidly after their food was changed for mulberry leaves. Lyman says, that silk-worms will feed on the leaves of the elm, dandelion, chicory, and nettle;* and Bellonius relates that in Ethiopia they feed upon fig leaves—but then the silk is weaker, and the caterpillars themselves have a languid, unhealthy appearance, and frequently die. Some years ago, experiments were made in the neighbourhood of Montpelier, to feed silk-worms on the leaves of the *scorzonera*, a plant which can be easily raised. The attempt perfectly succeeded, for out of one hundred and fifty silk-worms, only three or four died, and the cocoons were of the same weight and odour as those of caterpillars fed on mulberry leaves. M. Turck, of Plombières, having proposed the employment of the leaves of scorzonera to feed silk-worms, Mademoiselle Coge, of Epinal, tried the experiment with complete success. This new food did not in the least degree derange their vital functions, nor their habits. The silk produced was not inferior to that yielded by silk-worms fed on mulberry leaves; and it was not only better than that obtained from others fed on lettuce leaves, but in quantity was at least double. Silk-worms are also fond of the leaves and flowers of cowslips; but the silk yielded upon that food is not of the best quality. The Madagascar silk-worms, which are of larger size, feed on the Angola pea, a shrub indigenous to the island, and suspend their cocoons from its branches.

As silk-worms seem to feed only on such plants as contain a milky juice yielding caoutchouc, or Indian rubber, such as the mulberry, lettuce, dandelion, milk-thistle, castor-oil plant, *ficus religiosa*, &c., it is inferred that it requires some portion of this tenacious substance in its food to enable it to produce silk. Professor Debzenne, has discovered a method of dissolving old silk rags, so as to reduce them into a glutinous pulp, like dissolved caoutchouc, which is in fact its primitive state, and which can be spun out again and wove into new silk, as strong and beautiful as before; an important advance, as hitherto worn-out silk has been of no value whatever. The professor has found it difficult, however, to reproduce the dyed portions of silk, and more especially the black ones; but expects yet to overcome this difficulty. It may here be mentioned that some Nottingham lace-workers have succeeded in imparting the gloss and appearance of silk thread to cotton. Having dissolved silk thread by a chemical process, the cotton

* *Amœnitates Academicæ*, vol. v. p. 553.

thread is drawn through the solution, and becomes so coated with silk, that the eye cannot detect the difference between the two articles.

The eggs of the silk-moth naturally are not hatched till they have been laid six weeks, but in countries where they are reared, the women hatch them in a much shorter period by carrying them in their bosoms. M. Perrottet, who a few years ago was deputed by the French to examine into the best means of promoting the growth of silk in the West Indies, remarked that silk-worms eggs which he took with him from France, and kept in those hot countries for seven or eight years, could not be hatched until the end of eight or nine months, notwithstanding the high temperature, and then only at long and irregular intervals; but when the same eggs were put in an ice-house for four or five months, they were hatched within ten days from their being exposed to the surrounding atmosphere, and nearly all at once.

The quantity of silk yielded by a single cocoon is variously stated. Boyle, in his *Treatise on Effluviums*, p. 11, relates that a physician and his wife having carefully unwound and measured the silk of a cocoon, ascertained that its length exceeded three hundred yards, though it weighed only two grains and a half. Some say a cocoon will often yield a continuous thread of silk extending to the length of three hundred and thirty-three yards. Baker, in his *Microscope made Easy*, tells us that a cocoon being wound off, was found to yield nine hundred and thirty yards, which being weighed with the utmost exactness, were found no heavier than two grains and a half. How exquisitely fine must such thread be,—yet this is nothing in comparison with that which is spun by the silk-worm soon after it is hatched from the egg. Mr Hoffman, of Munich, has successfully adopted a method of increasing the thickness of the most valuable layer in the silk-worm's cocoon. So thin is the silk-worm's thread, that many folds are twisted together to form our finest sewing thread. Such, too, is the extreme fineness of prepared silk, that it varies from a 1700th to a 2000th part of an inch in diameter. Mr G. R. Porter computes that it ordinarily requires three thousand five hundred silk-worms to produce one pound weight of silk, and that consequently fourteen thousand millions of these creatures annually live and die to furnish this article of luxury to England alone, for the quantity she consumes amounts, in each year, he says, to more than four millions of pounds weight.

Mr J. Jarves states that in the Sandwich Islands the American breed of silk-worms has been crossed with the Chinese, and with the greatest success. Two varieties of cocoons have been produced thereby, inclining more to the American than the Chinese, one of a deep orange colour, the other of a delicate straw colour. They answer admirably, requiring from five to seven thousand to the pound of raw silk. They reel with the greatest ease, so much so that native women, with but few days' instruction, can turn off

from one-half to three-fourths of a pound daily. Their eggs hatch in from fifteen to twenty days, and come to maturity in twenty-four, and continue to do so for upwards of a year, without degenerating in quality. It has been attempted to cross this breed again with the pure American; but the silk-worms resulting therefrom are found to have so many of the characteristics of the American as to be of little use. In 1846, Mrs Whitby made several experiments to ascertain the relative value of eggs procured from different places; and she gives, as the result, the following comparative weight and number of the cocoons produced, all the silk-worms being treated in every respect alike:—

77 English cocoons weighed 2 oz., and produced ¼ oz. of raw silk.
55 Poictiers cocoons weighed 2 oz., and 460 produced 1¾ oz. ditto.
47 Bordeaux cocoons weighed 2 oz., and 480 produced 1¾ oz. ditto.
45 Italian cocoons weighed 2 oz., and 213 produced 1 oz. ditto.
340 Bengal cocoons weighed 2 oz. Produce not stated.

The Bengal were so inferior to the others, that they were not wound off. Although the Bengal grower has four crops of silk, and the English grower only one, Mrs Whitby thinks the English grower could compete with the former, for one cocoon reared in England is equal in weight to four of the Bengal; and the raw silk sells at from 25s. per pound, whilst the Bengal raw silk fetches only from 10s. to 11s. per pound.

One peculiarity of the silk-worm—that it does not stray as all other caterpillars do, but remains nearly stationary in the open box or tray wherein it is placed and fed, and there patiently remains till fresh supplies of food are supplied—admirably harmonises with its vast importance to mankind, in furnishing a material which affords our most elegant and beautiful, if not most useful garments. The same remark applies to the insect in the moth state, the female being quite incapable of flight, and the male, although of a much lighter make, and more active, can fly but very imperfectly; the latter circumstance insuring to us the eggs for the following season, and thus completes the adaptation of the insect, in its different stages, to the useful purposes it fulfils to our advantage.

Refined Utility; or Beauty in Agricultural Scenery. By DAVID GORRIE, Annat Cottage, Perthshire.—Natural and artificial beauties exist both separately and in combination. There is beauty in park scenery, the materials of which have been so arranged by the hand of man as to imitate the landscapes of nature, in as far as is consistent with the presence of art and the demands of civilisation. Our ideas respecting the beautiful and the sublime are enlarged in greater measure when the eye dwells on pure natural scenery, on which the impress of the Creator's hand is peculiarly visible, and amidst which the works of art appear not to claim part of the beholder's attention. And,

it may be remarked, there is in some respects a superlative degree of beauty in a landscape-painting, that bears evidence of having been produced by an artist of genius. Embodied on canvass, a landscape partakes largely of the etherial, and tends to excite more spirituality of feeling on the part of the entranced spectator than he would experience as resulting from viewing the material objects, whose forms, hues, and relative positions have been imitated by the pencil. The mind cannot but undergo a certain kind of refinement when contemplating, in a fitting mood, the effects that result from the painter's magic touch; but when real scenery, of which canvass only presents an imitation, is viewed in a meditative frame of mind, wonder and awe sometimes banish all thoughts about the mere artistical principles of beauty, or these come in only for a secondary share of the attention. Paintings refine the feelings,—natural scenery moulds, impresses, and instructs them, but draws them as much to the painful sublime, as to the pleasing beautiful.

The varied, rugged, picturesque scenery of nature is beautiful, grand, or sublime, irrespective of those ideas respecting fitness or usefulness which we are accustomed to attach to objects that bear the impress of the disposing hand of art. The towering rock, the frowning precipice, the gushing cascade, the smooth-flowing stream fringed with shrubs and flowers, the calm and placid lake that mirrors the stars in its bosom, the green hill-side bright with sunny rays, the moorland-waste empurpled with fragrant heath, the gloomy forest, with its majestic oaks and pines, its glades, recesses, and advancing masses and groups,—all invite contemplation as objects that are in themselves worthy of regard, although unconnected, it may be, with the immediate supply of our physical wants, or the furtherance of the comforts and conveniences of life. It is not so with park or garden scenery, designed and arranged though it may have been in that variety of the modern or English style which professes to be peculiarly an imitation of nature. Picturesque rocks, waterfalls, and masses of trees may prevail in a park, and these trees may have been planted, as those that grow far from the haunts of man are often placed, along the dens and valleys, and feathering up the secondary dells that diversify the hill-side, leaving the knolls and the summits of the hills to rise up clear and unbroken; but then there is the park pale and the sheep walk, the herd of tamed deer, the approach, the bridge, and above all the mansion-house,—all of which combine to show that within the field of vision nature is not predominant, but that art has entered with her altering, arranging, and disposing hand—that, in short, man bears rule over the space of ground that spreads out before the observer's eye; and, therefore, that although ornate effect may have been a principal object in the designer's estimation, his plans must necessarily have been made in some degree conformable to the requirements of utility. But, in agricultural scenery, art prevails

entirely over nature, and utility is the boldly-professed primary object. The landscape of the farm, to be really and permanently attractive, must possess characteristics the very opposite of those which are so pleasing and impressive as component parts of the wild and rugged scenes of the dell, and dingle, and forest-glade. Utility is here the foundation on which the superstructure of beauty must be built, and beauty here must always gain the attention of men in general, because it is the beauty of refined utility, and is fitted to interest those social feelings essential to human beings living in a state of civilisation. It is a kind of beauty that stands by itself, equally removed in the nature of its principles from that of the mountain side and rocky dell, and that of the Dutch flower-garden or French parterre, in which are geometrical lines and forms laid down according to fancy, and not as the result of attention to usefulness and convenience, like those of the farm. The orderly yet varied lines of the architectural flower-garden or parterre, are, like those that diversify the surface of mosaic pavement or of printed cotton cloth, merely beautiful in themselves, and that only by reason of their peculiar forms, or the arrangement of their colours and shades; whereas those that mark the boundaries and subdivisions of a farm are attractive to the eye in relation to the avowed object of their existence. They are fitted to please and gratify the observer, independently of that questionable kind of beauty which is sometimes conferred on works of art, and especially on architectural edifices, by a mere *tacking on* of ornamental appendages, which can show no good reason for either their form or their position; and which, with all deference to those who employ them so liberally even in this boasted age of refinement, are indicative only of a half-civilised state of society,—a state in which irrational ornament is more attractive than the simple grandeur of adorned utility. As the modern park in some measure combines the sublimity of natural scenery with as much of convenience and usefulness as is requisite for insuring the comfort and prosperity of those who reside in and around the mansion-house, the castle, or the villa, so the ornamental form exhibits a combination of convenience and usefulness with those peculiar beauties which art can confer, even in the disposal of materials similar to some of those which constitute a natural landscape; and the farm, as well as the park, has peculiar points of attraction which other scenery does not possess. The florist despises not the lowly heart's-ease because a neighbouring tulip is more gaudy and splendid; and the landscape-gardener ought not to pass over those portions of a country-side that may be devoted to the plough, as if agricultural scenery were necessarily harsh and ungainly. The peculiar beauties of corn-field scenery have a veritable existence, although they may differ in kind from those of the pleasure-ground and park. And it is not intended to refer here to that interest which attaches to

those varied developments of vegetable life, which may be studied and admired in the corn-field and meadow, irrespective of anything that the landscape-gardener can accomplish. Life, all-pervading life, and its strange mysteries and wondrous manifestations, can deck the face of the earth with a species of beauty and grandeur which man cannot imitate, and which belongs to another department of study than that which professionally occupies the landscape artist's mind. It was this kind of beauty that inspired the bard of Ayrshire to sing,

> Corn rigs and barley rigs
> Corn rigs are bonnie,

on some sunny summer's-day, after a reviving shower had satiated the thirsty soil, and when he could feel what a kindred spirit felt in giving utterance to these few but soul-stirring words,

> I see a freshness in the earth,
> A glory in the sky.

It is not with universally approved sentiments such as these, nor with the moral sublimity which they infer, but with the principles that ought to direct the general arrangement of outlines and disposition of materials in agricultural scenery, that we have to do, while endeavouring to show in what way, or variety of ways, a refined utility may exist in the wake of the plough.

It may seem somewhat superfluous to state that a landscape composed of arable fields and their accompaniments, is necessarily unfit for being copied by the painter on his canvass. No artist would attempt to introduce a piece of newly ploughed or harrowed soil into his foreground, or a field of ripe yellow corn into the grey of his third distance. In the one case his colouring would appear deranged and inharmonious, and in the other there would be naught of the quiet, passive sublime, so much delighted in by lovers of the fine arts, in his picture; for the idea of freshly turned-up mould would rather indicate that restlessness and mutability which are out of harmony with the calm composure of the green grass, the grey rock, and the blue sky mirrored in the placid lake, that belong to the natural landscape, whether seen in painting or in reality. But all this detracts not from that kind of beauty which arable scenery claims as its own. Neither is the gorgeous splendour of the flower-garden lessened because the painter would turn away with feelings of aversion from its smooth gravel-walks, and its neatly-raked beds of red earth. Flowers in a state of cultivation must have the earth into which their roots descend subjected to the disturbing effects of the hoe and the rake, in order to their proper development and their congruous appearance; and gravel-walks are necessary accompaniments to flower-beds, to the end that the individual and collective loveliness of the flowers may be rightly enjoyed. Wrought earth and rolled gravel in a garden

devoted to flowers—and, it may be added, in one set apart for the culture of culinary herbs—are looked upon as beautiful, because they are evidently allied to utility, and manifest a regard to neatness and high keeping. The painter may, with much pleasing effect, introduce docks, and thistles, and broken palings, into the foreground of his picture; but neatness, order, fitness, and congruity ought ever to prevail in ground devoted to the spade and the plough—to Flora and to Ceres.

Attempts have been made to introduce the picturesque into farm scenery, and to unite the park and the farm in one harmonious landscape; but these attempts have signally failed. The motley hues of the farm cannot pleasingly combine with the quiet composure of the lawn; and as little can they appear in unison with the native ruggedness of rocky scenery, or the mazy beauty of the flowery dell, with its winding stream and its rushing cascade. The picturesque farm, or, as it has been termed for lack of an expressive English appellation, the *ferme ornée*, has been created at the expense of that fitness and propriety which should belong to everything that is the avowed production of art, and whose evident object is that of pecuniary gain. The shady pool of the ornamental farm, liable as it is to have its waters polluted at certain seasons of the year by decaying leaves from the branches of overhanging deciduous trees, forms a more than inefficient substitute for the airy, open, and old-fashioned drinking-pond. The rustic cottage, with its low walls, small windows, and dilapidated chimneys, may look well in a painted landscape, though placed in a damp and sunless valley, but is evidently an unfit and unwholesome dwelling for the ploughman and his family; and, on the other hand, an elaborately ornamented cottage does not always show, from the arrangement of its parts, that it is commodious and comfortable within; and, moreover, appears in the character of a livery badge that openly infers a state more of slavery than of servitude on the part of its occupier. The picturesque, untrimmed row of thorns and other shrubs that occupies the place of the hedge, robs the farmer of valuable ground, prevents free ventilation, harbours game to the injury of growing corn, and fails, after all, to add rational and consistent beauty to the farm, or to the country-side of which that farm constitutes a part. And if hedgerow trees form part of the picture, they add to its incongruity, and are seldom pleasing objects when individually considered; for farmers claim—and that rightly—the privilege of pruning and disfiguring such trees, in order to prevent them, in some measure, from injuring their corn. Such hedgerows, moreover, if laid out in irregular and fantastic lines, combine with trees scattered singly or in groups over the surface of corn-fields, in unblushingly interfering with all ideas of fitness and utility; and those trees that stand singly must necessarily have their branches shorn over in a

line parallel to the ground, at the height of the horses' heads, and are liable to have the earth raised above their roots by the operations of the plough, till their stems at last appear to be abruptly inserted in the ground, with no indication of those convexly-curved root limbs that diverge into the soil on each side of a forest tree, showing the collar or junction of the root with the stem above ground, to the benefit of the tree's health, and the increase of its beauty and grandeur as an individual object.

The true way of rendering a farm ornamental is to bring boldly forward the hand of art as the creator of the fit, the congruous, and the useful, to the exclusion of anything that would interfere with the embodiment of these ideas. On level grounds, the principles of geometrical landscape-gardening may be easily adapted to the materials which the farm affords or requires. Fences are essential parts of a farm, and it is not desirable to conceal them, as is often done with good effect in the picturesque scenery of a park. Neatly-clipped hedges, whether of deciduous plants, like the thorn, or of evergreens, like the spruce, add to the beauty of agricultural scenery, and are far more in keeping with their position than the anomalously picturesque hedgerow can ever be. The fences of a farm, whether they have been formed of live or of dead materials, should wear an appearance of permanency and unperishableness; for the well-built stone dyke and the well-trained hedge form more congruous and befitting boundaries to a corn-field or meadow, than those rustic railings of unbarked timber that are admissible in picturesque scenery, on the very account of that temporary and unpermanent appearance which they present.

If trees of any kind exist in the line of a straight fence, they appear more in keeping with their position when of a fastigiate habit of growth, than when their heads are low, round, or spreading. And it is partly by employing trees that are different in shape or in species from those generally cultivated in the neighbourhood that the artist can leave such traces of his handiwork as shall leave unmistakeable evidence in future that his disposing hand has been called into exercise. The presence of Lombardy poplars, evergreen oaks, locust-trees, thujas, and cypresses, instead of the more common British trees, will, if their positions be in every way rendered suitable, at once indicate a high degree of art and refinement.

There are many concomitant circumstances to be attended to in the laying out of a farm that will be both ornamental and expressive of its purpose, which it is unnecessary to mention in detail. If general principles be once fixed and acknowledged, the various departments of practice cannot be productive of difficulty or perplexity to the designer. Knowledge of architectural fitness will enable him to appreciate beauty of design in a farm-house, and to avoid that adherence to precedent, the result of which is seen in

the sameness that exists in this department of building all over the country—a sameness the more insufferable, because the faults of the almost unvarying mode of arrangement followed by the builders are more conspicuous than its commendable points. The principles of harmony, to say nothing of the promptings of benevolence, will teach the designer that the houses of farm-servants, though of a humbler cast than the dwelling of their employer, should partake of its architectural style, and be in some way grouped with it in the landscape, so as to indicate the true relation that exists between the several inhabitants,—a relation which, it may be remarked, would be akin to that of tyrant and slave, did the vastly inferior condition of too many of our ploughmen's cottages to that of their employer's residence prove a correct indication of its nature. It is needless to say that nothing wasteful, or wanting in neatness and order, should be seen about the farm-yard buildings; nor that the architecture of these buildings should at least be inferior in style and finishing to that of the cottages inhabited by the farm-servants.

But the great, the leading principle to be acknowledged in at once insuring beauty, and avowing the hand of art, in agricultural scenery, remains to be stated. It is the crowning of cultivated hills and rising grounds with wood. This were sufficient of itself to show a high degree of refined utility. Nature, as has already been hinted at, generally fills her valleys and dens with trees, and leaves her higher grounds unclothed; and picturesque park scenery is in this particular successfully moulded after nature's model. But the artistical improver of arable ground plants the heights, not with formal clumps, but with sweeping masses, whose outlines are always partly undiscernible; and in so doing, creates the imaginary but interesting effect of heightening hills and deepening valleys; while at the same time he appropriates only the poorer soils to trees, leaves more productive ground to corn and grass, breaks the sweeping force of devastating winds, provides needful shelter for animals at pasture, and ameliorates the climate of a whole district. He creates and disposes shady groves, sweet glades, smiling corn-fields, and cheerful meadows, so as to give a pleasing effect to rural scenery, and all the time manifests that he is in truth a friend and not a foe to the farmer.

How are we to ascertain how long Lime or Manure will last? From the German.—Not long since we proposed to the agricultural world—"*At what intervals should lime be applied?*" The answers we received to this inquiry were so vague and contradictory, that we could not deduce from them one satisfactory rule for our guidance. Fortunately, by means of chemistry, we have at least the hope of arriving at a solution of this difficulty. The following series of experiments will perhaps assist a thinking farmer

how to ascertain when the lime he has applied may be exhausted, and, consequently, when to apply a second dose.

In the last winter I applied, on part of one of my fields, marl and soil in alternate heaps, so that a morgen (= $\frac{3}{4}$ English acre) would receive about

20 single horse-loads of marl, and
50 ... ... of soil.

To examine this application more particularly,—

1. *The Marl.*—A single horse-load of marl contained 16 cubic feet; of this one cubic foot (carefully dried) weighed about 80 lb., so that the whole morgen would receive . . . 25,600 lb.

When carefully analysed, I find that we must deduct, for organic matter, ...	17,256
Leaving mineral substances, ...	8,344

consisting of—

8.0 per cent,	or 2,048	lb.	iron and alumina.
18.0 ...	or 4,608	...	carbonate lime.
3.0 ...	or 768	...	... magnesia.
1.5 ...	or 384	...	potash.
1.5 ...	or 384	...	soda.
0.3 ...	or 76	...	phosphoric acid.
0.2 ...	or 51	...	sulphuric acid.
0.1 ...	or 25	...	common salt.
	8,344	lb.	

2. *The Soil.*—A load of the soil contained 21 cubic feet; of this one foot (carefully dried) weighed 30 lb., so that the morgen would receive . . . . 31,500 lb.

This consisted of 56 per cent of organic matter, . .	17,640
Leaving mineral matter, ...	13,860
Deducting the carbonic acid, ...	11,748
Leaving, ...	2,112

consisting of—

1.03 per cent,	or 142	lb.	silica.
2.65 ...	or 367	...	alumina and iron.
5.11 ...	or 708	...	carbonate lime.
1.78 ...	or 246	...	... magnesia.
1.93 ...	or 267	...	potash.
0.89 ...	or 123	...	soda.
1.35 ...	or 187	...	sulphuric acid.
0.52 ...	or 72	...	phosphoric acid.
	2,112	...	

So that one morgen would receive—

Sulphuric acid,	In the marl, 51 lb.	In the soil, 187 lb.	Total, 238 lb.
Phosphoric acid,	„ 76	„ 72	„ 148
Common salt,	„ 25	„ ...	„ 25
Carbonate of lime,	„ 4,608	„ 708	„ 5,316
Carbonate of magnesia,	„ 768	„ 246	„ 1,014
Potash, .	„ 384	„ 267	„ 651
Soda, . .	„ 384	„ 123	„ 507
Alumina and iron,	„ 2,048	„ 367	„ 2,415
Silica, . .	„ ...	„ 142	„ 142
Nitrogen, .	„ ...	„ 63	„ 63
	8,344	2,175	10,519

It now remains for us to compare this application with what is removed by the crops taken from the soil.

The crops were—	1. Rye,	yielding	10 scheffels.*
	2. Potatoes,	"	100 "
	3. Vetches,	"	6 "
	4. Oats,	"	15 "
	5. Pease,	"	6 "
	6. Clover,	"	25 cwt. of hay.

1. *Proportion of Corn to Straw.*

100 parts of the plant of	Rye	consisted of	29 corn and	71 of straw.
"	Potato	"	86 tubers	14 of tops.
"	Pea and Vetch	"	27 seed	73 of straw.
"	Oats	"	38 seed	62 of straw.

2. *The Dry Matter of the Crops, dried at 230° F.*

1000 lb. of rye weighed 834 lb. 10 scheffels at 80 lb.

=800 lbs. of seed, containing	667 lb.	of dry matter.
The rye-straw,	1,590	"
The potatoes,	2,410	"
The potato tops,	417	"
Vetches,	537	"
The straw of vetches,	1,411	"
Oats,	594	"
Oat straw,	873	"
Pease,	548	"
Pea straw,	1,431	"
Clover hay,	2,173	"

3. *Ash and Nitrogen contained in the above substances.*

Rye,	contained	15.34 lb.	of ash and	11.40 lb.	of nitrogen.
Rye-straw,	"	57.24	"	4.77	"
Potatoes,	"	96.40	"	36.15	"
Potato tops,	"	70.89	"	9.17	"
Vetches,	"	16.11	"	21.48	"
Vetch straw,	"	91.71	"	23.99	"
Oats,	"	23.76	"	13.07	"
Oat straw,	"	46.65	"	3.49	"
Pease,	"	16.44	"	23.02	"
Pea straw,	"	100.17	"	28.62	"
Clover hay,	"	162.98	"	45.63	"

4. 100 *Parts of the Ashes of these different Plants consisted of*—

	Sulph. Acid.	Phosph. Acid.	Common Salt.	Lime.	Magnesia.	Potash.	Soda.	Oxide Iron.	Silica.
Rye,	0.70	47.43	...	4.91	10.64	27.89	5.80	0.91	1.72
Rye straw,	0.82	3.75	0.83	9.14	2.41	16.84	0.35	1.36	64.50
Potato,	5.60	15.62	3.46	5.46	10.24	55.67	1.02	0.59	2.34
Potato tops,	2.69	4.57	2.28	20.23	3.14	34.30	2.24	0.74	29.81
Vetch,	2.61	36.21	1.95	8.31	4.46	34.63	9.53	1.35	0.95
Vetch straw,	0.97	12.31	2.11	43.33	3.05	18.64	1.13	0.87	17.59
Oats,	1.00	17.12	...	2.68	8.93	14.26	0.92	1.22	53.87
Oat straw,	4.92	3.84	4.79	9.38	3.92	25.63	4.47	2.72	40.33
Pease,	4.56	34.89	1.80	5.39	8.68	35.94	7.33	1.00	0.41
Pea straw,	7.23	9.11	5.97	38.69	6.53	9.78	3.55	0.74	18.40
Clover hay,	3.33	8.40	4.95	28.80	8.40	25.73	12.92	0.40	7.07

* 1 Dresden Scheffel=2.34 English quarters.

5. *There were removed from the Soil, to which the Marl and Soil had been applied, the following weights of the various inorganic substances and Nitrogen.*

Cases.		Sulphuric acid.	Phosphoric acid.	Common salt.	Lime.	Magnesia.	Potash.	Soda.	Iron and alumina.	Silica.	Nitrogen.
Rye.	Corn, (bushel*)	0.11	7.26	.	0.75	1.63	4.28	0.69	0.14	0.26	11.40
	Straw, ...	0.47	2.16	0.48	5.23	1.38	9.64	0.30	0.77	36.91	4.77
Potato.	Roots, ...	5.40	15.06	3.34	5.26	9.87	53.67	0.98	0.57	2.25	36.15
	Stalks, ...	1.91	3.24	1.03	14.53	2.22	24.32	1.59	0.52	21.13	9.17
Vetch.	Seed, ...	0.42	5.83	0.31	1.34	0.72	5.58	1.54	0.22	0.15	21.43
	Straw, ...	0.69	11.29	1.93	39.74	2.80	17.09	1.04	0.80	16.13	23.99
Oats.	Corn, ...	0.24	4.07	.	0.64	2.12	3.39	0.22	0.29	12.79	13.07
	Straw, ...	2.15	1.68	2.09	4.00	1.71	11.19	1.95	1.19	17.60	3.49
Pea.	Grain, ..	0.75	5.74	0.30	0.89	1.43	5.90	1.20	0.16	0.07	23.02
	Straw, ...	7.24	9.13	5.98	38.76	6.54	9.79	3.55	0.74	18.44	28.62
Clover Hay, (25 cwt.) ..		5.43	13.69	8.07	46.94	13.69	41.93	21.06	0.65	11.52	45.63

* A bushel is nearly equal to an English sack.

6. *General Table showing the quantity of the various substances applied, and for how many of the different Crops this application is sufficient.*

	Sulphuric acid.	Phosphoric acid.	Common salt.	Lime.	Magnesia.	Potash.	Soda.	Ox. Iron, etc. etc.	Silica.	Nitrogen.
Applied in soil and marl,	233.41	148.88	25.66	2977.00	490.00	657.49	507.35	2415.29	142.76	0.63
Removed by the Rye,*	0.57	9.44	0.48	5.98	3.01	13.92	4.09	0.91	37.17	16.17
.. .. Potatoes,†	7.31	18.30	4.97	19.59	12.09	77.99	2.57	1.09	23.38	45.32
.. .. Vetches,‡	1.31	17.12	2.24	41.08	3.52	22.67	2.58	1.02	16.28	45.47
.. .. Oats,§	2.39	5.75	2.09	4.73	3.83	14.58	2.17	1.48	30.39	16.56
.. .. Pease,‖	7.99	14.87	6.28	39.65	7.97	15.69	4.75	0.90	10.61	51.64
.. .. Clover,¶	5.43	13.69	8.07	46.94	13.69	41.93	21.06	0.65	11.52	45.63

* So that by the rye the phosphoric acid would not be removed in less than 15 years.
† There would be sufficient phosphoric acid and potash for 8 years for potatoes.
‡ For vetches there is also enough phosphoric acid for 8 years.
§ For oats there is enough phosphoric acid for 25 years.
‖ For pease there is enough phosphoric acid for 10 years.
¶ For clover there is enough phosphoric acid for 11 years.

In other words, this table shows us that the land would be impoverished if we grew upon it

15 crops of rye, or
8 „ potatoes, or
8 „ vetches, or
25 „ oats, or
10 „ peas, or
11 „ clover.

It also shows, first, how much more impoverishing the deep-rooted crops, as potatoes, vetches, peas, and clover* are, than rye or oats, and that, the more often they are grown on a soil, manure

* This can surely only apply to clover when it is allowed to ripen its seed.

must be applied as often; second, phosphoric acid is evidently the first substance which will require to be supplied; and that, third, if we also supply potash and soda along with the bones, as a source of phosphoric acid, it will be a long time before we need add any more lime. (*Sprengel.*)

Analysis of a Coprolite or Fossil Guano. By T. J HEREPATH.—

Water,	3·400	
Organic matter,	trace.	
Silica,	13·240	
Carbonate of lime,	28·400	
Phosphates of lime, magnesia, iron, &c.,	53·730	= phosphoric acid, 26·615
Sulphate of lime,	0·736	
Loss,	0·586	
	100·000	

Judging from the geological position in which these deposits are found, it would appear highly probable that the idea formed by Dr Buckland, with regard to their nature, is really correct—namely, that they consist principally of the fossil excretions, or *coprolites*, of carnivorous reptiles resembling our modern crocodiles.

This supposition is also borne out by the following analysis of the bone of an ox, which the coprolite closely resembles in composition, when the bone is deprived of its fat and moisture:—

Phosphate of lime,	56·752	containing phosphoric acid, . 27·609
Phosphate of magnesia,	3·256	
	59·008	

The recent discovery of this novel manure is only one out of the many advantages which agriculture is to reap, in common with every other art, of the progress of science.

Method of detecting the Flour of Indian Corn in that of Wheat. From *Journ. de Chem. Med.*—The sample is sifted, and 2 grains of the finest flour mixed in a test-tube, with 4 grains of nitric acid, and well stirred with a glass rod. After this, add 60 gram. of water, and then 2 gram. of carbonate of potash, dissolved in 8 gram. of water. When no Indian corn is present, as soon as the carbonic acid has escaped only *yellowish* flakes separate; but when Indian corn is present, some *orange* yellow particles subside, which are easily detected. In this way an admixture of from 4 to 5 per cent of Indian corn with wheaten flour may be detected. [The above test may be the best that the substances admit of, but it is an unsatisfactory one, as the distinction between yellow and orange yellow is not very clearly marked.]

*High Farming.**—High farming has the same effect upon the soil that high feeding has upon stock—it puts the soil into the highest condition, and causes its productions to be in the highest perfection. The object of high farming is thus of high import, and therefore worthy of attainment. Is it attainable in all, or in most cases? Let us consider whether its attainment is practicable.

Ordinary farming for many years allowed 12 tons of farm-yard manure to the acre to raise a crop of turnips; it increased the quantity to 15 tons, and more recently it has had the liberality to give 3 tons of guano in addition to the 15 of manure. The result generally is the production of turnips to the amount of 20 tons the acre, and this manuring is restricted to once in the five years. The high farming practised by Mr M'Culloch at Auchness, in the county of Wigtown, affords 40 loads or 30 tons to the acre for the green crops, with 3 cwt. of guano, and from 10 to 15 bushels of bone-dust. The farm-yard manure is mixed in alternate layers with 2000 loads of peat-moss which have been long exposed to the air, and 500 loads of sea-ware, and £250 worth of guano and bone-dust, purchased every year. Besides this manuring of the fallow division, the oats and wheat are top-dressed with 2 cwt. of guano. The extent of ground from which the Italian ryegrass and clover have been mown in the morning is also top-dressed every afternoon out of the urine tank. And about £270 worth of animal food—as hay, linseed, beans—are purchased every year. The particular results of this liberal management are the doubling of the turnip crop, the doubling of the oat crop, the increasing the wheat crop from 20 to 36 bushels on the acre, a large increase on the potato crop, and the mowing of the soiling grass from three to four times every year. The former stock of the farm consisted of "15 cows, 12 calves kept till one year old, 40 year-olds summered, 3 two-year-old cattle, 20 sheep, 6 work-horses, 1 riding-horse, 3 young horses, and 3 horses grazed in summer." The stock now kept are, "5 cows, 130 cattle fed fat, 150 sheep fed on turnips, 10 work-horses, 2 riding-horses, and 3 young horses." The general result is, that the former entire annual value of the produce might be taken at £642, while now it is not less than £2518—an increase of fourfold.

The soil upon which these results have been obtained extends over 260 acres, of which 30 are reclaimed moss, 40 black moorish soil, intermixed with white sand, 125 light sandy soil, and 65 of superior red turnip soil. With the exception of the last class of soil, comprising 65 acres, the remaining 195 acres are by no means prepossessing; the 125 acres of light sandy soil "being better adapted to wheat than to oats or barley," when only in a high state

---

* *High Farming, under liberal Covenants, the best Substitute for Protection.* By JAMES CAIRD, Farmer, Baldoon. Blackwood and Sons. 1849.

of cultivation, and not otherwise. But what put them in a state of high cultivation but high farming? The subjacent greywacke is not a fertile companion to the subsoil. The situation of the farm is, however, favourable; the exposure is warm, south-eastern; the elevation low, ranging from 10 to 70 feet above the sea. The winters are mild and moist—frost being very slight, and never of long continuance; and the whole farm is sheltered from the prevailing winds by the woods surrounding the demesne of Logan. Taking all these circumstances into account, there are many farms in the kingdom equally well situated, and in possession of a much better soil. It is true that 2000 loads of moss and 500 loads of sea-ware are annually available, but not without much labour. Allowing four *rakes* a-day, the 2500 loads of moss and sea-ware imply the employment of two horses in single carts for a whole year, independent of the manual labour bestowed in preparing and collecting those ingredients. However useful they may be, being on the spot, both are inferior to guano or bone-dust, which are available to every farm. The only thing that seems out of proportion to the farm is the accommodation in the steading for the feeding of 130 beasts; and the erection of so large a steading was probably the speculation of the proprietor, with the view of obtaining an increase of rent, at a period when the farm shall have been put in the highest state of fertility, by the high farming about to be practised upon it. The old rent was £152; and the produce then of £642 gave a security for its payment of 4¼ times its amount. The rent now is £262, for the payment of which the present produce gives a security of 9½ times its amount. If a produce worth £642 could afford to pay a rent of £152, a produce worth £2518 could as well afford and give as good security to pay a rent of £595; and the difference between these rents being £443, this sum implies an increase of £13,290, at 30 years' purchase, on the value of Auchness as a farm, to the estate of Logan, principally by means of high farming. In building the large steading, and draining the moss, with the view that the experiment of high farming should be fairly tried on his farm of Auchness, the gallant proprietor had not been so unmindful of his own interest, in the long run, as some people imagine.

We think it a pity that Mr Caird has given a political aspect to his statements, by introducing them along with the subject of protection. The consequence has been, that all the agricultural papers which directly advocate the return of protective duties have declared that the example he holds out for imitation is impracticable at the present time. Sound principles and good practice required no adventitious aid from politics to recommend them to the adoption of sensible farmers. Had the striking and indisputable facts in the possession of Mr Caird been simply narrated a little more in detail, without the slightest allusion to any political subject, we are per-

suaded they would have told with a force that would have been irresistible. Anyhow his facts are invaluable.

Wireworm—Soda ash.—These infest the upper strata of soils, particularly of those that are replete with fibrous roots—as is land after grass and clovers. Might not deep tillage have a remedial effect by burying the intruders, and placing them in deep soil of a quality quite strange to their natural habits? The question may be worth a thought in reference to that pest of England — the *wireworm.* I do not, however, attach much importance to it; yet it serves, in passing, to introduce a subject which has presented itself in the *Agricultural Gazette* of April 29, 1848, (p. 293,) headed *Wireworm—Soda ash.*—When I resided in Berkshire, an experimentalist whom I knew in 1845-6, had heard of this ash, and employed it on his grass lands, with some confidence: the results did not come to my knowledge; but, in the article I now allude to, we shall find some practical details that are worthy of record. The "*British alkali*" or *Soda ash*, varies much in quality, and it is a product of the decomposition of common salt at the soda works; and, according to Dr Fownes, "contains, when good, from 48 to 52 per cent of pure soda, partly in the state of *carbonate*, and partly as *caustic hydrate*, the remainder being chiefly sulphate of soda (Glauber's salt) and common salt, with occasional traces of sulphate or hyposulphate, and also oxanide of sodium." These constituents prove it to be a very potent application: and this the annexed passage, from an article signed *Thomas Everett*, will tend to confirm. The following extract claims much attention:—

> I had four acres of light loamy land *dibbled with two pecks of wheat* per acre, last autumn, (after tares,) and although so small a quantity of seed was sown, there was as good a plant as was desirable. A week or two after the wheat had appeared, I perceived that at least one-fifth of the plants had died. I examined the roots, and found wireworms at almost all the dead or dying plants. I brought some home, and put some, with some mould, into two basins, and tried to destroy them by mixing some carbonate of lime, (query, *quick*-lime,) with one, and by mixing salt and solutions of salt with the other; yet both of these reputed destroyers of the wireworm did not effect their destruction. Knowing soda ash to be more powerful than either of the articles used, I obtained some of Mr Mark Fothergill, 40 Upper Thames Street, London, sowed it by hand just before rain, at the rate of 1¼ cwt. per acre, and am sure it either destroyed them, or caused a departure from near the surface into the deep recesses of the subsoil, as I could not find one afterwards, though I examined minutely, nor has a single plant been injured since. It is necessary that the man who sows the soda ash should have on a stout pair of gloves, otherwise his hands would be much excoriated.
>
> Soda ash will not only destroy the wireworm, but it also acts as a powerful manure, which is clearly demonstrated by the luxuriant growth and healthy appearance of the wheat in question, which is not excelled, if equalled, by any about this part. I may state, in addition, that although so small a quantity of seed was used in the field, and so many plants were destroyed, there is no doubt that it will be the best field of wheat on the farm.

COMPARATIVE TABLE OF EUROPEAN COINS, WEIGHTS, AND MEASURES.

England.	France.	Prussia.	Austria.	Wurtemberg.	Baden.	Hanover.	Saxony.	Hessia.	Brunswick.	Oldenburg.	Mecklenburg.	Switzerland (Berne.)
1 acre ..	0·405 hectare = 38,341 sq. feet	1·584 morgen ..	0·703 joch.	1·283 morgen	1·124 morgen	1·555 morgen	1·467 morgen	1·618 morgen	1·617 morgen	2·804 juch. n. m.	0·622 morgen. ..	1·177 juchart.
1 foot = 12 inches ..	135·144 par. lines	11·653 Zoll.	11·559 Zoll..	1·064 foot. ..	1·016 foot. ..	1·043 foot. ..	1·078 foot. ..	1·219 foot. ..	1·068 foot. ..	1·031 foot. ..	1·048 foot .,	1·016 foot.
1 quarter	146·54·36cub. par. lines ..	5·288 sch.	4·726 metzen	1.904 sch. ..	1·938 malter.	1·555 malter.	2·34 sch. ..	2·271 malter.	0·934 sch. ..	13·286 sch.	7·475 sch. ..	1·706 mutt.
1 bushel	1831·79 cub. par. lines ..	0·661 sch.	0·591 metzen.	0·205 sch. ..	0·242 malter.	1·167 himten.	0·35 sch. ..	0·284 malter.	1·167 himten.	1·661 sch. ..	0·934 sch. ..	0·213 mutt.
1 gallon..	228·97 cub. par. inch ..	3·966 qt. ..	0·078 eimer.	2·472 maass.	3·028 maass.	1·166stubchen	4·851 kannen	0·028 ohm ..	4·849 qt. ..	3·318 kannen	2·504 kannen	0·027 saum.
1 lb. avoirdupois ..	0·453 kl. ..	0·969 lb. ..	0·809 lb. ..	0·969 lb. ..	0·907 lb. ..	0·969 lb. ..	0·970 lb. ..	0·907 lb. ..	0·970 lb. ..	0·941 lb. ..	0·937 lb. ..	0·872 lb.
£1 sterling	25·33 francs	6 thlr. 25 s. gr.	9 fl. 55 kr. ..	11 fl. 58 kr. (24 fl. fuss.)	11 fl. 58 kr. 24 fl. fuss.	6 r. thlr. 20 g. gr.	6 r. thlr. 20 g. gr. 25 h. gr.	11 fl. 58 kr. 24 fl. fuss.	6 r. thlr. 20 g. gr. ..	6 r. thlr. 8 gold g. gr.	6 r. thlr. 3 g. gr. gold.	17 frcs. 7 batz.
1 shilling..	1 fr. 26 13/20 c.	10 s. gr. 3 pf.	29¾ kr.	35 9/10 kr. ..	35 9/10 kr. ..	8 g. gr. 2⅔ pf.	10 h. gr. 2¼ pf.	35 9/10 kr. ..	8 g. gr. 2⅔ pf.	22 grot. ..	7 g. gr. 4½ pf.	8 17/20 batz.
1 new French foot = ⅓ metre = 147·765 par. line ..	ENGLAND. 1·096 ft.	1·062	1·0545	1·164	1·111	1·142	1·177	1·333	1·168	1·126	1·145	1·111

The coins are calculated as nearly as possible without using fractions.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.	Barley	Oats.	Rye.	Pease.	Beans.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 3	46 2	29 3	18 2	30 0	32 5	27 11
10	48 3	31 1	17 11	27 3	33 2	28 8
17	48 10	30 11	19 3	26 4	35 1	28 5
24.	46 1	30 4	18 7	26 3	34 3	29 0
Mar. 3.	47 9	29 6	18 0	25 0	34 4	29 8
10.	47 2	29 11	17 5	25 6	33 7	27 1
17	46 8	30 7	17 2	23 8	31 0	25 7
24.	44 8	28 2	18 2	27 0	30 11	26 9
31	44 0	29 7	15 8	23 7	32 0	25 7
Apr. 7	49 8	29 11	16 2	22 8	28 7	25 0
14.	45 10	29 6	19 11	24 0	29 11	24 2
21	47 6	30 4	18 10	25 0	28 0	27 4
28.	47 5	30 0	18 7	23 7	29 11	24 5
May 5.	49 11	32 5	18 5	23 9	29 7	27 11
12	47 10	30 7	18 0	24 0	30 5	26 1
19.	47 4	31 3	18 10	24 2	29 9	28 3
26.	46 2	23 9	20 5	23 11	32 3	27 10

EDINBURGH.

Date.	Wheat.	Barley	Oats.	Pease.	Beans.
1849	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 7.	46 6	28 3	20 6	28 6	29 3
14.	48 8	28 0	20 6	29 2	30 4
21.	47 9	28 6	19 8	29 4	30 1
28.	47 1	27 11	19 10	28 6	29 8
Mar. 7.	45 3	28 8	20 2	28 9	29 5
14.	46 2	29 4	20 5	28 1	28 7
21.	45 5	31 1	20 3	27 6	28 1
28.	47 2	30 5	19 9	28 0	26 6
Apr. 4.	47 1	27 8	19 6	27 8	28 4
11.	46 0	27 1	19 9	27 6	28 1
18.	46 4	27 6	20 3	28 2	29 0
25.	44 6	27 3	19 11	28 8	29 3
May 2.	45 1	26 11	19 8	29 0	29 7
9.	46 2	27 6	20 1	29 4	29 10
16.	45 4	27 11	19 6	28 8	29 4
23.	45 0	28 0	18 11	28 0	28 9
30.	46 0	26 6	20 4	20 6	30 4

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 3.	46 8	31 4	17 7	28 6	28 6	32 5
10.	45 9	28 6	18 2	37 9	29 2	33 1
17	47 2	27 7	18 11	28 9	28 4	25 11
24.	46 5	28 4	19 3	25 10	27 8	30 2
Mar 3.	45 7	29 8	19 7	26 8	26 0	29 7
10.	43 4	30 1	17 0	26 9	27 6	29 9
17.	45 5	31 3	17 10	25 9	27 10	35 1
24.	44 2	28 10	18 7	24 10	29 4	34 4
31.	42 8	26 3	18 11	24 6	28 0	33 10
Apr. 7.	44 3	28 2	18 7	25 3	27 8	30 11
14.	45 9	30 6	16 5	24 8	26 9	31 3
21.	45 0	34 7	17 11	24 4	26 4	29 10
28.	43 11	31 4	18 3	24 10	26 0	34 3
May 5.	45 4	32 6	18 6	24 6	25 9	28 6
12.	44 10	32 6	18 2	25 2	26 2	26 10
19.	46 1	31 6	19 9	24 9	25 8	25 0
26.	45 6	31 2	19 10	25 8	26 10	26 2

DUBLIN.

Date.	Wheat, p. barl. 20 st.	Barley, p. barl. 16 st.	Bere, p. barl. 17 st.	Oats, p. barl. 14 st.	Flour, p. barl. 9 st.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 2.	24 0	14 11	12 9	10 2	15 4
9.	25 1	15 4	13 1	10 11	15 10
16	25 5	15 1	12 10	10 4	15 9
23.	24 8	14 7	12 6	10 5	15 9
Mar. 2	25 1	14 11	12 8	10 7	15 6
9.	24 2	15 3	13 1	10 8	15 7
16.	25 6	13 8	11 10	10 6	15 4
23.	25 1	14 2	12 4	10 11	15 2
30.	25 0	15 1	13 0	11 1	15 1
Apr. 6.	24 9	15 6	13 3	11 4	15 0
13.	24 5	13 11	12 1	11 6	14 8
20.	25 0	14 6	12 5	11 9	14 2
27	24 8	14 8	12 4	12 2	14 8
May 4.	24 2	14 11	12 8	12 8	15 1
11	24 6	14 7	13 1	13 3	14 10
18.	24 2	16 6	14 4	13 5	14 9
25.	24 4	18 8	15 2	13 2	14 10

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average.	Wheat. Aggregate Average.	Barley. Weekly Average.	Barley. Aggregate Average.	Oats. Weekly Average.	Oats. Aggregate Average.	Rye. Weekly Average.	Rye. Aggregate Average.	Pease. Weekly Average.	Pease. Aggregate Average.	Beans. Weekly Average.	Beans. Aggregate Average.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 3.	45 1	45 7	28 10	29 9	16 11	17 3	28 5	28 0	33 0	34 9	30 3	31 8
10. . .	45 11	45 5	29 3	29 5	17 3	17 2	27 2	27 10	33 0	34 3	30 11	31 2
17. .	47 0	45 8	29 8	29 3	17 2	17 2	26 9	27 11	34 4	33 9	29 9	30 9
24. . .	46 4	45 10	29 9	29 2	17 5	17 2	27 8	27 10	32 11	33 4	30 10	30 8
March 3. ...	45 0	45 9	29 1	29 3	17 4	17 2	26 11	27 8	32 10	33 1	30 2	30 5
10.	45 1	45 10	29 0	29 2	16 11	17 2	26 10	27 4	33 1	33 2	30 1	30 4
17. ..	45 4	45 10	29 2	29 4	17 0	17 3	23 9	26 0	30 8	32 10	30 11	30 5
24. ..	44 9	45 8	28 10	29 3	17 1	17 2	26 4	26 5	31 6	32 7	28 9	30 1
31. ...	44 1	45 2	28 11	29 1	16 4	17 0	24 6	26 0	32 2	32 2	28 1	29 10
April 7. ...	44 5	44 10	28 9	28 11	16 9	16 11	26 5	25 10	29 6	31 8	28 2	29 4
14. . .	44 3	44 6	28 6	28 10	17 0	16 10	23 1	25 2	30 11	31 4	28 5	29 1
21. ...	44 5	44 6	28 8	28 9	16 8	16 9	22 4	24 5	28 9	30 7	28 11	28 10
28. ...	46 0	44 8	28 10	28 6	17 2	16 10	27 5	25 0	29 9	30 5	29 3	28 7
May 5. ...	46 9	45 0	28 11	28 9	17 6	16 11	25 4	24 10	30 1	30 2	29 8	28 9
12. ...	46 3	45 2	29 0	28 8	17 5	17 1	24 2	24 9	30 10	30 0	29 6	29 0
19. ..	44 9	45 3	28 0	28 6	17 8	17 3	26 9	24 8	29 11	30 1	30 7	29 4
26. ...	44 6	45 2	27 9	28 5	17 9	17 4	26 0	25 9	33 4	30 8	31 3	29 10

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1849.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Feb. .	Danzig	39 0 - 44 6	16 0 - 22 6	10 6 - 15 0	18 0 - 24 0	26 0 - 32 0	21 6 - 27 6
March	Danzig	36 6 - 42 0	16 0 - 24 0	11 0 - 16 6	17 6 - 22 6	25 0 - 30 0	20 0 - 25 6
April	Danzig	37 0 - 42 6	17 6 - 23 0	10 0 - 15 6	17 0 21 0	23 6 - 28 0	19 6 - 24 0
May	Danzig	36 0 - 41 0	16 6 - 21 6	9 6 - 14 6	16 0 - 20 6	21 6 - 26 0	18 6 - 23 0
Feb. ..	Hamburg	41 0 - 46 0	20 6 - 25 0	10 6 - 16 0	16 6 - 23 0	20 0 - 25 0	20 0 - 24 0
March	Hamburg	37 6 - 42 0	18 6 - 24 0	11 0 - 17 0	17 0 - 23 0	20 0 - 25 0	21 0 - 25 0
April..	Hamburg	36 6 - 41 6	17 9 - 23 6	10 0 - 15 0	16 0 - 22 0	19 6 - 24 6	20 0 - 24 6
May ..	Hamburg	35 0 - 41 0	16 0 - 21 0	9 6 - 13 6	15 6 - 21 0	19 0 - 24 0	18 0 - 24 0
Feb. ..	Bremen	36 0 - 42 6	18 6 - 24 0	9 6 - 14 9	20 0 - 24 0	22 0 - 27 6	20 0 - 27 6
March	Bremen	38 0 - 40 0	18 6 - 25 0	10 6 - 15 6	19 0 - 22 6	20 0 - 25 6	19 6 - 25 0
April .	Bremen	32 0 - 39 6	17 6 - 24 0	9 6 - 14 6	18 6 - 22 0	19 6 - 24 0	18 0 - 23 6
May ..	Bremen	31 6 - 36 6	16 6 - 22 6	9 0 - 13 6	17 6 - 21 0	18 6 - 23 0	18 6 - 23 0
Feb. ..	Königsberg	33 6 - 42 0	17 6 - 24 6	12 0 - 16 0	20 0 - 25 0	21 0 - 27 0	20 0 - 25 0
March	Königsberg	36 6 - 44 0	16 0 - 22 0	11 9 - 15 6	19 0 - 23 6	19 6 - 25 0	19 6 - 24 0
April .	Königsberg	32 0 - 42 0	14 6 - 20 0	10 6 - 13 9	18 6 - 22 0	18 0 - 22 6	19 0 - 23 6
May	Königsberg	35 6 - 41 0	13 6 - 16 6	9 0 - 11 6	18 0 - 21 6	16 6 - 20 6	18 0 - 22 0

Freights from the Baltic to the East Coast from 3s. 3d. to 4s. 6d. previous to the blockade of the ports, and from Odessa, etc., 7s. to 9s. 6d.

THE REVENUE.—From 5th April 1848 to 5th April 1849.

	Quarters ending April 5		Increase.	Decrease.	Years ending April 5.		Increase.	Decrease.
	1848.	1849.			1848.	1849.		
	£	£	£	£	£	£	£	£
Customs . ..	4,392,650	4,593,119	200,469	..	17,960,275	19,129,829	1,169,554	..
Excise ...	2,002,601	1,820,575	..	182,026	12,080,482	12,650,114	569,632	..
Stamps	1,618,668	1,549,171	..	69,497	6,760,932	6,041,351	..	719,581
Taxes .	143,902	148,101	4,199	..	4,347,571	4,318,403	..	28,668
Post-Office ..	221,000	234,000	13,000	..	866,000	789,000	..	77,000
Miscellaneous	77,307	138,792	61,485	..	209,640	243,651	34,011	..
Property Tax	2,041,640	2,011,519	..	30,121	5,459,369	5,317,244	.	142,125
	10,497,768	10,495,277	279,153	281,644	47,684,269	48,489,592	1,773,197	967,374
	Deduct Increase		...	279,153	Deduct Decrease		967,347	
	Decrease on the qr. ..			2,491	Increase on the year		805,850	

TABLES OF BUTCHER MEAT.—Per Stone of 14 Pounds.

Date.	LONDON.		LIVERPOOL.		NEWCASTLE.		EDINBURGH.		GLASGOW.	
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1849.	s. d. s. d	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Feb. ..	6 6 - 7 6	7 3 - 8 6	6 3 - 7 3	6 3 - 7 6	5 9 - 6 6	6 3 - 7 3	6 0 - 7 0	6 3 - 7 3	6 3 - 7 6	6 3 - 7 3
March .	4 9 - 6 9	5 9 - 8 3	5 9 - 6 9	6 3 - 7 3	5 6 - 6 3	6 0 - 7 0	4 9 - 6 6	4 9 - 6 9	5 6 - 7 0	5 6 - 6 9
April .	4 6 - 6 6	5 3 - 7 3	5 6 - 6 6	6 0 - 7 0	5 3 - 6 0	5 9 - 6 9	4 9 - 6 3	4 9 - 6 6	5 3 - 6 9	5 6 - 6 6
May . .	4 9 - 6 9	5 6 - 7 6	5 9 - 6 9	6 3 - 7 3	5 6 - 6 3	5 9 - 6 9	5 0 - 6 6	5 0 - 6 9	5 6 - 6 9	5 6 - 6 9

PRICES OF ENGLISH AND SCOTCH WOOL.—Per 14 Pounds.

ENGLISH.	s. d. s. d.	SCOTCH.	s. d. s. d.
Merino, ...	11 6 to 16 6	Leicester Hogg, ...	9 6 to 13 6
.. in grease, ...	9 0 to 12 0	.. Ewe and Hogg, ...	8 0 to 11 6
South-Down, ...	12 0 to 16 0	Cheviot, white, ...	7 6 to 10 0
Half-Bred, ...	9 6 to 12 6	.. Laid, washed, ...	5 6 to 8 6
Leicester Hogg, ...	9 6 to 13 6	.. unwashed, ...	4 3 to 6 6
.. Ewe and Hogg, ...	6 6 to 11 0	Moor, white, ...	4 9 to 6 9
Locks, ...	5 6 to 7 6	.. Laid, washed, ...	4 0 to 5 0
Moor, ...	4 0 to 6 0	.. unwashed, ...	3 3 to 4 3

...ARS PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1848, by the Imperial Measure.

ABERDEEN.

	Imp. qr.
...ithout fodder	41/
...h fodder	
...ithout fodder	25/10
...ith fodder	30/10
...st, without fodder	25/6
—— with fodder	30/6
...nd, without fodder	24/
—— with fodder	29/
...tato, without fodder	16/8
—— with fodder	22/6
...its, without fodder	15/4
—— with fodder	21/2
	32/6
	23/6
	60/
..., per 140 lb.	12/8

ARGYLE.

	Imp. qr.
	45/4
	28/4
	26/
	20/4
	31/
..., per 140 lb.	15/10

AYR.

	Imp. qr.
	44/8
	24/8½
	26/8
	16/8
	30/6
	31/9¾
..., per 140 lb.	14/

BANFF.

	Imp. qr.
	47/3
...with fodder	30/6
...without fodder	26/6
...irst, with fodder,	29/
without fodder	24/
...cond, with fodder	
—— without fodder	
...tato, with fodder	23/6
without fodder	18/
...mon, with fodder	22/4
—— without fodder	16/10
	24/3
	24/
..., per 140 lb.	12/3

BERWICK.

	Imp. qr.
	45/3¼
...Merse	27/3¾
...Lammermuir	24/3¼
...erse	20/3¼
...ammermuir	17/6¾
	33/6
..., per 140 lb.	15/5¼

BUTE.

	Imp. qr.
	46/8
	27/0¾
	26/3¾
	19/5
	28/2
..., per 140 lb.	14/8¾

CAITHNESS.

	Imp. qr.
	22/4¾
	22/4¾
...tato	18/3
...rly Angus	16/3¾
...peton	
...n	15/7
...ack	
..., per 140 lb.	13/6

CLACKMANNAN.

	Imp. qr.
Wheat	43/5¾
Barley, Kerse	27/3
—— Dryfield	27/1½
—— Muirland	
Oats, Kerse	18/8
—— Dryfield	17/5¾
—— Black	
Pease and Beans	26/1½
Malt	48/11¼
Oatmeal, per 140 lb.	14/2¾

DUMBARTON.

	Imp. qr.
Wheat	47/4
Barley	27/3
Bear	25/2
Oats	20/3
Pease and Beans	31/8
Oatmeal, per 140 lb.	15/10

DUMFRIES.

	Imp. qr.
Wheat	49/10
Barley	26/6
Bear	27/
Oats, White	16/6
—— Potato	17/10
Pease,	
Rye	29/
Beans	32/6
Malt	62/4
Oatmeal, per 140 lb.	13/6¾

EDINBURGH.

	Imp. qr.
Wheat, First	44/7
—— Second	40/
Barley, First	27/9
—— Second	25/
—— Third	22/6
Oats, First	19/1
—— Second	17/
Pease and Beans	24/9
Oatmeal, per 112 lb.	11/3
—— 280 lb.	28/1½

ELGIN AND MORAY.

	Imp. qr.
Wheat	48/
Barley	27/8
Oats	19/
Pease	30/
Rye	29/7
Oatmeal, per 112 lb.	12/2

FIFE.

	Imp. qr.
Wheat, White	43/8
—— Red	41/8
Barley	26/1½
Bear	24/1½
Oats	17/3¾
Pease	22/9
Beans	22/9
Rye	25/7½
Malt	50/9¾
Oatmeal, per 280 lb.	27/11½

FORFAR.

	Imp. qr.
Wheat	43/4
Barley	25/6
Bear	23/2
Oats, Potato	16/8
—— Common	18/7
Pease and Beans	23/5
Rye	22/9
Oatmeal, per 140 lb.	13/

HADDINGTON.

	Imp. qr.
Wheat, First	56/10
—— Second	51/7½
—— Third	47/9¾
Barley, First	33/9
—— Second	31/6¾
—— Third	29/2¾

HADDINGTON (Continued.)

	Imp. qr.
Oats, First	24/6¾
—— Second	22/3¾
—— Third	20/6¾

INVERNESS.

	Imp. qr.
Wheat, without fodder	48/6
—— with fodder	53/6
Barley, without fodder	27/
—— with fodder	31/
Bear, without fodder	22/9
—— with fodder	25/9
Oats, without fodder	20/2
—— with fodder	25/8
Oatmeal, per 112 lb.	14/

KINCARDINE.

	Imp. qr.
Wheat, without fodder	45/0¾
—— with fodder	54/0¾
Barley, without fodder	25/4
—— with fodder	31/4
Bear, without fodder	22/9
—— with fodder	28/9
Oats, White, without fodder	16/8¾
—— with fodder	23/8¾
—— Potato, without fodder	18/7¾
—— with fodder	25/7¾
Pease, without fodder	20/
—— with fodder	27/6
Beans, without fodder	21/9
—— with fodder	29/9
Oatmeal, per 140 lb.	13/0¾

KINROSS.

	Imp. qr.
Wheat	34/2
Barley, First	27/1
—— Second	24/1
Bear	
Oats, White, First	17/1
—— Second	15/1
—— Black, First	
Second	
Pease and Beans	26/4
Oatmeal, per 140 lb.	13/8

KIRKCUDBRIGHT.

	Imp. qr.
Wheat	46/8
Barley	26/
Bear	
Oats, Potato and Hopetoun	17/8
—— Common	16/8
Beans	
Rye	
Oatmeal, per 140 lb.	13/4

LANARK.

	Imp. qr.
Wheat, First	46/5¾
—— Second	41/
Barley, First	29/2
—— Second	22/8
Bear, First,	27/
—— Second	24/6¾
Oats, First	18/0¾
—— Second	16/2¾
Pease	32/1¾
Beans	33/5
Malt	60/
Oatmeal, First, per 140 lb.	14/3¼
—— Second	13/5¾

LINLITHGOW.

	Imp. qr.
Wheat	44/8
Barley	27/3
Oats	18/8
Pease and Beans	27/10
Malt	48/11
Oatmeal, per 140 lb.	14/4
—— 112 lb.	11/6¾

NAIRN.

	Imp. qr.
Wheat	
Barley, with fodder	

FIARS PRICES—*Continued.*

NAIRN, (Continued)

	Imp. qr.
Barley, without fodder	26/
Oats, with fodder	25/6
—— without fodder	19/
Oatmeal, per 112 lb.	12/6

ORKNEY.

Bear, per 352 lb.	13/4
Malt, per 140 lb., with duty	17/4
—— per 140 lb., without duty	9/1
Oatmeal, per 140 lb.	10/10½

PEEBLES.

Wheat,	38/1¼
Barley, First	27/10¾
—— Second	26/4
—— Third	24/2½
Oats, First	18/9
—— Second	17/5¼
—— Third	16/5½
Pease, First	
—— Second	28/5½
—— Third	
Oatmeal, First	14/3½
—— Second	13/6½
—— Third	13/1

PERTHSHIRE.

Wheat, First	46/6
—— Second	35/
Barley, First	26/2
—— Second	20/
Oats, First	18/7
—— Second	14/6
Pease and Beans	23/8
Rye	26/
Oatmeal, per 140 lb.	14/

RENFREW.

	Imp. qr.
Wheat, First	46/2
—— Second	46/1
Barley, First	28/6
—— Second	27/0¼
Bear, First	25/6¾
—— Second	24/8½
Oats, First	20/7¾
—— Second	19/11
Beans, First	30/5
—— Second	29/8¼
Pease	29/
Oatmeal, per 140 lb. First	15/0¼
—— Second	14/11½

ROSS AND CROMARTY.

Wheat, First	41/2
—— Second	39/6
Barley	25/10
Bear	23/
Oats, First	19/5½
—— Second	19/2
Pease,	29/7½
Beans	27/8½
Oatmeal, per 140 lb.	15/5
Barley Meal, 140 lb.	10/11

ROXBURGH.

Wheat	48/3 5/12
Barley	26/7½
Oats	19/10 5/12
Pease	31/7 8/12
Beans	31/1 4/12
Oatmeal, per 140 lb.	14/6½

SELKIRK.

Wheat
Barley
Oats, Potato
—— Common
Pease
Oatmeal, per 280 lb.

STIRLING.

Wheat
Barley, Kerse
—— Dryfield
Oats, Kerse,
—— Dryfield
—— Muirland
Pease and Beans
Malt
Oatmeal, per 140 lb.

SUTHERLAND.

Wheat
Barley
Bear
Oats, Potato
—— Common
Pease
Rye
Oatmeal, per 140 lb.

WIGTOWN.

Wheat
Barley
Bear
Oats, Potato
—— Common
Malt
Rye
Pease
Beans
Oatmeal, per 280 lb.

We may inform our English readers, that Fiars Prices are the average prices of grain, as ascertained every year, verdict of Juries, in every County of Scotland. The Juries are summoned in spring, and ascertain, from the e produced to them, the average prices of the preceding crop. By these prices, rents payable in grain, and similar co are generally determined; but the main object is to convert into money the stipends (for the most part fixed at a quantity of grain) of the Scottish Clergy.

EXPERIMENTAL AGRICULTURE.*

The results of past trials and suggestions for new field experiments with the salts of ammonia.

By James F. W. Johnston, F.R.S.

Ammonia and its salts are now recognised to be very generally useful in promoting vegetable growth. They impart to plants a beautiful green colour; increase the rapidity, and prolong the duration of their growth; make them more succulent and grateful to cattle; and, for the most part, add to the bulk and weight of the crop. In regard to them, three points require to be investigated by experiment,—*first*, their special effect upon particular crops in different soils and circumstances; *second*, their comparative effects; and *third*, their comparative economy to the practical farmer.

§ 1—*Composition of caustic ammonia, and of the carbonate, sulphate, muriate, phosphate, nitrate, acetate, oxalate, and humate of ammonia.*

Ammonia or caustic ammonia is a kind of air or gas which is readily prepared by mixing together quicklime and sal-ammoniac, each in the state of fine powder. It is colourless, but has the strong pungent odour familiarly known in hartshorn and smelling-salts. Its presence is readily detected, not only by its smell, but by the white fumes it produces when a feather dipped in muriatic acid, or in strong vinegar, is brought near to the place where its presence is suspected. It consists of—

Nitrogen, ...	82.35
Hydrogen, ...	17.65
	100.

Water absorbs from 400 to nearly 700 times its bulk of this gas, acquiring, at the same time, all the sensible properties of the gas. The common hartshorn of the shops is such a solution of ammonia in water.

The salts of ammonia which have been, or are likely to be, employed—either with advantage in practical agriculture, or with the prospect of interesting theoretical results—are the carbonate, the sulphate, the muriate, the nitrate, the phosphate, the acetate, the oxalate, and the humate.

---

* This article forms the twelth and part of the thirteenth chapter of a work now in the press, under the title of *Experimental Agriculture*, and which will be published in October or November.

These salts are composed as follows,—

1°. Carbonate of ammonia of the shops,	consists of	Carbonic acid,	28.8
		Ammonia,	55.9
		Water,	15.3
			100.

This salt gives off ammonia when exposed to the air; hence the powerful odour to which it owes the name of smelling-salts. In consequence of this property, it seldom contains so much ammonia as the above numbers represent. When it ceases to give off this strong smell, it contains only 21½ per cent of ammonia. It is then what chemists call *bi*-carbonate, the pure smelling-salts being *sesqui*-carbonate of ammonia. When dissolved in water, on the other hand, as it is in ammoniacal liquor, it loses carbonic acid, and becomes what is called the neutral carbonate, which contains 39 per cent of ammonia. This salt of ammonia, therefore, is of inconstant composition, and, consequently, is not well adapted for accurate field experiments.

2°. Sulphate of ammonia in dry crystals,	consists of	Sulphuric acid,	60.6
		Ammonia,	25.8
		Water,	13.6
			100.

This salt is without smell, and, when pure, is constant in composition.

3°. Muriate of ammonia, or sal-ammoniac,	consists of	Muriatic acid,	68.2
		Ammonia,	31.8
			100.

This salt is also without smell, and is of constant composition. It deliquesces slowly when exposed to moist air.

4°. Phosphate of ammonia consists of	Phosphoric acid,	53.9
	Ammonia,	25.7
	Water,	20.4
		100.

This salt effloresces slightly in the air, and loses a part of its ammonia. It is much more stable, however, than the carbonate. It exists in the urine of man, and in that of carnivorous animals. It is prepared in the same way as the phosphate of soda, by treating an excess of burned bones with sulphuric acid, decanting the liquid, saturating it completely with carbonate of ammonia, and setting it aside to crystallise.

5°. Nitrate of ammonia consists of	Nitric acid,	67.5
	Ammonia,	21.2
	Water,	11.3
		100.

This salt deliquesces readily in moist air, and slowly loses a small portion of its ammonia.

6°. Acetate of ammonia is prepared by saturating common vinegar with carbonate of ammonia, and evaporating by a gentle heat. It may be more cheaply made by mixing crude wood vinegar (pyroligneous acid) with the ammoniacal liquor of the gas-works. The composition of this salt has not been accurately determined. I notice it here chiefly in consequence of the statement of Persoz, that a very small quantity of it applied to certain plants produces a decidedly injurious effect,—a statement which is deserving of careful experimental examination.

7°. Oxalate of ammonia consists of	Oxalic acid,	58.1
	Ammonia,	27.4
	Water,	14.5
		100.

This salt crystallises in beautiful small prisms, and is soluble in 28 parts of cold water. It is much used in the laboratory, and, from its price, can never be employed in practical agriculture. It will be interesting, however, to ascertain the nature of its influence upon growing plants.

8°. Humate of ammonia is formed by digesting caustic ammonia or carbonate of ammonia on rich vegetable mould, or on dried and powered peat. The ammonia causes the decaying vegetable matter to swell very much, and forms a dark-brown solution of humate of ammonia. The composition of this humate is not accurately known. It is deserving of being made the subject of field experiment, however, because of the great probability which exists that one of the functions of ammonia in the soil is to form such soluble combinations with the organic matter contained in the soil, and thus to make it capable of entering into the roots of plants.

All the salts of ammonia are readily soluble in water, and they all give off ammonia when mixed with quicklime or slaked lime, or with caustic potash, soda, or magnesia; more slowly when mixed with the carbonate of potash, (pearl ash or wood ashes,) or with the carbonate of soda, (common soda of the shops, or soda ash,) and still more slowly when mixed with carbonate of lime, (mild lime or chalk,) or with carbonate of magnesia.

§ 2.—*Functions performed by the salts of ammonia in the soil and in the plant.*

1°. *Functions in the soil.*—The chemical functions performed by ammonia in the soil will vary with the state of chemical combination in which it is used.

a Caustic ammonia and carbonate of ammonia will neutralise acid substances, if any such exist in the soil—will decompose earthy

and metallic sulphates and chlorides, forming sulphate of ammonia and sal-ammoniac—will combine with and render soluble the humic, ulmic, and other organic acids, which will thus be rendered available to the nourishment of plants, and, in the presence of lime or alkaline carbonates, will be slowly converted into nitric acid.

b Sal-ammoniac, in the presence of the carbonates of lime or magnesia, will be partially or completely decomposed, forming chloride of calcium or magnesium, and carbonate of ammonia. The latter salt will then act in one or other of the ways above described.

c Sulphate and phosphate of ammonia will, in like manner, yield their acid more or less completely to potash, to soda, to lime, and perhaps to magnesia, forming sulphates and phosphates of these substances, while their ammonia is converted into carbonate.

d Nitrate of ammonia will give up a part of its acid to any earthy or alkaline carbonates which may exist in the soil, and will be thus partly converted into carbonate. Its acid may also contribute, by the oxygen it contains, to promote the decomposition of organic matter; but this will only take place beneath the surface, where the light does not penetrate, and where much organic matter is present.

Nitrate of ammonia exists in and is naturally formed in most soils. It yields its nitric acid to the carbonates of lime and magnesia when they are present in the soil, and is itself converted into carbonate. Thus, while it brings the lime and magnesia into a state into which they can readily enter the plant, the ammonia becomes itself capable of decomposing sulphates and chlorides, either in the soil or in the plant.

e The acetate, oxalate, and humate of ammonia may all undergo slow oxidation in the surface soil, producing nitric acid from the ammonia, and carbonic acid from the acetic, oxalic, and humic acids which they contain.

2°. *Functions in the plant.*—The salts of ammonia may undergo the above changes more or less completely in the soil, but they may also enter directly into the roots of plants, and perform certain functions which are important to their healthy and rapid growth. Thus,—

a They supply nitrogen—an element very necessary to the growing plant—in a form in which it is immediately available for the production of those nitrogenous compounds which not only [illegible] important part of the substance of the plant, but appear [illegible] preside over those chemical changes constantly taking [illegible] its sap, and upon which the health and rapidity of its [illegible] depend.

[illegible] protein compounds they are called—exist in [illegible] extremities of the roots, and are supposed [illegible] afterwards carried up to the other

parts of the plant by the ascending sap. Ammonia, and especially when it enters in combination with humic acid, is peculiarly adapted to the production of these compounds,* and hence, probably, one reason why its action upon growing plants is in many cases so immediate and striking.

b Among the intelligible chemical uses of ammonia in the sap, I may mention that, when it enters the roots in the state of carbonate, it has the power, and probably exercises it, of decomposing the alkaline sulphates and chlorides, converting them into carbonates, and thus preparing them to combine with the organic acids formed in the sap, with which we find them so generally united.

c The salts of ammonia carry into the plant the sulphuric, muriatic, humic, and other acids with which they may happen to be combined, and thus supply other elements which are directly or indirectly necessary to the production of the parts of the plant.

d They are all the producers of, or are necessary to the production of numerous chemical changes in the sap. These changes are as yet by no means understood, but we know that they take place, and that nitrogen, sulphur, phosphorus, &c., are necessary to the production of them. None of the substances we have it in our power to apply to growing plants is capable of undergoing more varied transmutations than ammonia. Such transmutations it not only itself undergoes in the interior of plants, but, in so changing, it causes, or is accompanied by, similar chemical changes in other substances also—without which constant and varied metamorphoses, the healthy growth of plants could not proceed.

§ 3.—*Experiments with carbonate of ammonia, and with ammoniacal liquor.*

I am not aware of any field experiments which have been made with carbonate of ammonia in any other form than that in which it occurs in the ammoniacal liquor of the gas-works. This liquor varies in strength, and, besides carbonate, it contains also sulphate of ammonia and sal-ammoniac in uncertain proportions. Although, therefore, when diluted with three or four times its bulk of water, this liquid has proved a very valuable application to grass land,† to young corn, and to many other crops, the results obtained with it do not satisfactorily bring out the unaided effects of carbonate of ammonia. I give examples of its effect upon wheat, upon oats, and upon grass cut for hay.

---

* Johnston's *Lectures on Agricultural Chemistry and Geology*, 2d edition, p. 243.

† Johnston's *Lectures*, 2d edition, p. 617.

1°. *On wheat.*—Mr Bourhill, at Musselburgh in Mid-Lothian, applied it to a crop of wheat, with the following increase per imperial acre:—

	Grain.	Straw.
Nothing gave . .	23 bush.	57 cwt.
Ammoniacal liquor, 240 gallons,	35 ...	87½ ...

The increase here was very considerable, both in grain and in straw.

2°. *On oats.*—In 1842, Mr M'Lintock, near Glasgow, top-dressed separate portions of a field of Blainslie oats with various substances, and, among others, with 400 gallons an acre of carbonate of ammonia, by which I understand him to mean ammoniacal liquor, with the following results per imperial acre:—

	Grain.	Straw.	Chaff.
No application gave . .	35¾ bush.	92 stones	304 lb.
Carbonate of ammonia, 400 gallons,	45½ ...	120 ...	320 ...
Rape-cake, 280 lb., . .	43½ ...	108 ...	320 ...

In this case the application was evidently very useful, more so than 2½ cwt. of rape-cake. It may, I believe, in many cases, be pretty safely concluded, that where rape-cake does good, the impure carbonate of ammonia of the gas-works may be applied with advantage also. It is less useful when the land is already rich than where it is comparatively poor in animal and vegetable matter.

3°. *On grass.*—Applied at the rate of 150 gallons per acre, diluted with 500 gallons of water, it gave, per acre,—

Undressed, ...	20½ cwt. of hay
Dressed, ...	61½ ...
Increase, .	41 ...

Here the crop was nearly tripled; an effect dependent, no doubt, in some measure on the state of the land.

These experiments prove the value of ammoniacal liquor, and afford a strong presumption in favour of carbonate of ammonia applied alone; but, as I have already said, they do not satisfactorily bring out the special and unaided action of carbonate of ammonia.

Pure carbonate of ammonia is too high in price to be recommended for field experiments, but trials on a small scale may be made with it, especially in comparison with the other salts of ammonia which are now usually employed as manures.

... sulphate of ammonia.

... sively employed as a manure, ... more generally ... than any other of the salts of

ammonia. This has arisen chiefly from its greater abundance, and from the comparative lowness of its price. It is to corn and grass crops that it has hitherto been most frequently applied.

1°. *On wheat.*—In 1847, Mr Main applied it on the 1st of February to a portion of Taunton-Dean wheat, with the following result in comparison with sulphate of soda:—

	Grain.	Straw.
No application gave .	27½ bush.	19½ cwt.
Sulphate of ammonia, 2 cwt.	33¼ ...	29½ ...
Sulphate of soda, 2 cwt. .	32 ...	24¾ ...

I have added the result of the action of sulphate of soda, for the purpose of marking the difference in the effects of the two sulphates. Both largely increased the produce of grain, and nearly to the same extent, but the sulphate of ammonia added about 5 cwt. more to the produce of straw. It had the usual effect of the salts of ammonia in promoting growth more than mineral sulphates are observed to do.

2°. *On oats.*—The following table exhibits the results of four experiments made upon oats, top-dressed in the spring of 1843, on different farms near Turriff, in Aberdeenshire:—

a At Darra, after turnips—

	Grain.	Straw.	Chaff.
Nothing gave	57 bush.	31 cwt.	302 lb.
Sulphate of ammonia, 2 cwt. .	59 ...	42 ...	118 ...

b After lea, at Rothie Brisbane—

	Grain.	Straw.	Chaff.
Nothing gave	54½ bush.	40 cwt.	640 lb.
Sulphate of ammonia, 2 cwt. .	86 ...	59 ...	136 ...

c After lea, at Mill of Laithers—

	Grain.	Straw.	Chaff.
Nothing gave	43 bush.	20 cwt.	272 lb.
Sulphate of ammonia, 2 cwt. .	56 ...	28 ...	412 ...

d After lea, at Lower Cotburn—

	Grain.	Straw.	Chaff.
Nothing gave	35½ bush.	20 cwt.	300 lb.
Sulphate of ammonia, 2 cwt. .	57½ ...	34 ...	336 ...

In all these experiments, except the first after turnips, the increase both of straw and grain was very considerable. The manure employed for the turnip crop of the previous year may account for the smaller increase in grain in the first experiment made at Darra. It will interest the physiologist to observe how very different the weights of chaff are with which the grain in the several crops was covered.

3°. *On turnips* few experiments have been made and recorded. Mr Fleming, in 1842, made one upon yellow turnips, to which no farm-yard manure was added. The land was trenched out of grass, and must have been in good heart, or it would not have yielded from 11 to 13 tons of bulbs without any manure.

Nothing, 1st plot, gave . . .	11 tons 8 cwt. of bulbs.
„ 2d „ . . .	12 „ 17 „
Sulphate of ammonia, 1 cwt., . .	24 „ 11 „
Sulphate of magnesia, 1 cwt., . .	14 „ 17 „
Nitrate of soda, 1 cwt., . . .	27 „ 2 „
Rape-dust, 15 cwt., . . .	24 „ 11 „ *

This experiment, supposing, as the large differences seem to justify us in doing, that the results are to be depended upon in the absence of duplicate experiments, is very interesting. In trenched land, it seems to say that substances containing nitrogen are likely to be deficient, and the use of them, therefore, on such land profitable to the farmer. It is not unimportant to remark, however, that the increase of bulb was by no means in proportion to the absolute quantity of nitrogen in the several manures that contained it. Thus the proportions of nitrogen added, and the increase of bulbs in the three cases, were as follows:—

	Nitrogen added per acre.	Increased produce per acre.
Sulphate of ammonia, 1 cwt. .	23.7 lb.	11 tons 14 cwt.
Nitrate of soda, 1 cwt. . .	18.6 „	14 „ 5 „
Rape-cake, 15 cwt. . .	72.5 „	11 „ 14 „

This table shows that the smallest addition of nitrogen produced the largest increase, while the largest addition (in the rape-cake) gave the smallest increase of crop. We shall consider this kind of anomaly more at length in a succeeding section.

4°. *On grass cut for hay*, numerous experiments have been made. I shall only insert a few of the results which have been made public.

a In 1843 Mr Melvin, at Ratho, Mid-Lothian, top-dressed his grass with sulphate of ammonia, and with the nitrates of potash and soda, with the following results:—

Nothing gave, per acre .	306 stones of hay.
Sulphate of ammonia, [illegible] cwt.	[illegible]96 „
Nitrate of soda, [illegible]	[illegible]49 „
Nitrate of potash, [illegible]	405 „

The increase was large with all these applications. I shall in a subsequent section consider how far it was in proportion to the quantity of nitrogen the several applications contained.

b The three following experiments were made at Barochan in [illegible] three different fields, the first being sown grasses, the

---

[illegible] edition Appendix, p. 56

two others old lea, top-dressed each with 2 cwt. of sulphate of ammonia per acre. I introduce also the results of the application of muriate of ammonia to other portions of the same fields :—

	Sown grasses.	Six years old lea.	Thirty years old lea.
Nothing gave . . .	41½ cwt.	22½ cwt.	27½ cwt.
Sulphate of ammonia, 2 cwt. .	76⅓ „	40 „	40 „
Muriate of ammonia, 2 cwt. .	72 „	48¼ „	38 „

In all these cases also the increase was large, and especially so in the sown grasses. On the whole, the equal weights of sulphate and muriate of ammonia may be said to have produced nearly equal effects; though the equivalent weights of these two salts are such that 67 lb. of muriate ought to produce as great an effect as 94 lb. of sulphate, supposing the acids they respectively contain to exercise no special or peculiar action on the growth of grass.

It will appear from the results I have inserted in this section, and which are not selected to prove any view of my own, but are introduced simply as they have come to my hands, that the sulphate of ammonia, skilfully and prudently used, may, in the hands of the intelligent and enlightened farmer, prove a means of considerably augmenting his ordinary profits.

§ 5.—*Results of experiments with muriate of ammonia, (sal-ammoniac.)*

In the preceding section I have given the results of certain comparative experiments with the sulphate and muriate of ammonia. I refer the reader to these results of the application of the muriate, and introduce here a few others only.

1°. *To wheat.* Mr Fleming, of Barochan, obtained from a small application only a small increase of grain. Thus—

No dressing gave	25 bushels, each	61 lb.
Sal-ammoniac, 20 lb. . . .	26¾ „	62 „

The quantity applied in this case was too small to yield any decisive result.

2°. *On oats.* *a* In 1846 Mr Main, at Whitehill, Mid-Lothian, applied it to oats after turnips, top-dressed on the 26th of May :—

	Grain.	Straw.
Nothing gave	45 bushels	24 cwt.
Muriate of ammonia, 2 cwt. . . .	71½ „	32 „

The larger dose applied in this experiment gave a striking increase both in grain and straw.

b In 1842 Mr M'Lintock, near Glasgow, applied it on the 4th of April to Blainslie oats, succeeding a crop of oats in the

previous year. The following table shows the results in the immediate corn crop, and the after hay crop of 1843:—

	Grain.	Straw.	Chaff.	Hay in 1843.
Nothing gave .	35¾ bush.	92 stones	304 lb.	201 stones
Muriate of ammonia, 1 cwt.	45⅛ „	120 „	260 „	195 „

3°. *On rye.* Mr Fleming in one of his early experiments obtained from a crop of rye, slightly dressed with sal-ammoniac, the following result:—

	Grain.	Straw.
Nothing gave	14 bushels	36½ cwt.
Sal-ammoniac, 20 lb. . . .	19 „	43¾ „

This small top-dressing produced apparently a considerable effect, but the whole crop was too small to allow any confidence to be placed on single results.

4°. *On grass*, cut for hay. *a* At Barochan, in 1846, it was applied to three different fields of grass, afterwards cut for hay. The top-dressing was made on the 28th and 30th of April; horn-dust was applied at the same time in comparative experiments:—

	1°. Sown grasses.	2°. Six years old lea.	3°. Thirty years old lea.
No application gave . .	41½ cwt.	22½ cwt.	27½ cwt.
Muriate of ammonia, 2 cwt. .	72 „	48½ „	38 „
Horn-dust, 1½ cwt. . . .	—	48 „	31¾ „ *

The increase in the sown grasses, by the application of the muriate of ammonia, was especially remarkable. In the second experiment the horn-dust had nearly an equal effect with the sal-ammoniac.

b Mr Kuhlmann applied it in the two successive years of 1845 and 1846, the former, in French Flanders, a very wet, the latter a very dry year [illegible]ith the following effects upon the produce of ha[illegible] in each ye[illegible] [illegible]er hectare:—

	1845. First cut	1845. Second cut.	1846.
N[illegible]	[illegible]608	2136	3519
Sal-ammoniac, 200 [illegible]	[illegible]	1723	5576
[illegible]	[illegible]	413	2057

[illegible] an increase of hay, but [illegible] force of the sal-ammoniac, in [illegible] expende[illegible] [illegible]ing, unless we suppose that [illegible] washed some of it out of the soil.

[illegible] material, the application of

* [illegible] Society, July 18[illegible]

muriate of ammonia might be safely recommended as worthy of trial, even on the part of the farmer who seeks for profit only.

§ 6.—*Results of experiments with nitrate of ammonia.*

The only experiment made by weight and measure with nitrate of ammonia, with which I am acquainted, has been published by Mr M'Lintock, of Harley Works, near Glasgow. He applied it in 1842 to a second year's crop of Blainslie oats, top-dressed on the 13th of May, with the following results:—

	Grain.	Straw.	Chaff.	Hay in 1843.
No application gave .	35¾ bush.	92 stones	304 lb.	201 stones.
Nitrate of ammonia, 96 lb.	57 „	161 „	448 „	197½ „

There was here a very considerable increase both in grain and in straw. Even the chaff was nearly doubled in weight. The next year's hay, however, was not sensibly affected.

The fact that both the ammonia and the acid with which it is combined in this salt contain nitrogen in a form in which plants are accustomed to take up and appropriate it, has rendered it probable that, weight for weight, the nitrate of ammonia would more largely promote the growth of plants than any other salt of ammonia. It is expensive, however, and is not a usual article of commerce, and therefore few experiments have hitherto been made with it. But it is very desirable that such experiments should be made, as they would not only throw light on some interesting points of theory, but might lead to useful suggestions in matters of practice.

§ 7.—*Results of comparative experiments with the different salts of ammonia, and with the nitrates of potash and soda.*

It will be interesting to compare together, so far as our present defective materials will allow, the actions of the several salts of ammonia upon the same crop, and the effects produced at the same time by the nitrates of potash and soda. The only comparative experiments of this kind I have been able to meet with are the following upon oats and hay:—

1°. *On oats*, after turnips, in 1846, Mr Main applied the sulphate and muriate of ammonia in comparison with nitrate of soda and the sulphates of soda and magnesia. The soil was light and sandy, and had been long cultivated without rest.

		Grain.	Straw.	Increase of Grain.
No application . .	gave	45 bush.	24 cwt.	
Sal-ammoniac, 2 cwt. .	„	71½ „	32 „	26½ bush.
Sulphate of ammonia, 2 cwt.	„	62 „	27⅓ „	17 „
Sulphate of soda, 2 cwt. .	„	64½ „	26¼ „	19½ „
Sulphate of magnesia, 2 cwt.	„	58¾ „	26½ „	13¾ „
Nitrate of soda, 2 cwt. .	„	45 „	21* „	—

* *Transactions of the Highland and Agricultural Society*, January 1848, p. 177.

In this experiment all the applications, except the nitrate of soda, did good. The action of the sal-ammoniac was most striking, but that of the sulphate of soda exceeded that of the sulphate of ammonia. If these results could be confidently relied on, we might suspect from them—

a That sal-ammoniac exercised a special action, under the circumstances, which neither the sulphate of ammonia nor the nitrate of soda was capable of doing.

b That the sulphuric acid in the three sulphates had more to do with their nearly equal action than the ammonia, soda, or magnesia with which it was combined.

c That the nitrogen in the nitrate of soda was not in a condition to contribute to the growth of the crop.

But we should be wrong to draw conclusions in regard to any of these points. Suspicions of this kind are only useful when they lead to renewed and more careful experiments.

2°. Again to oats, the second year's crop of this grain on the same field, Mr M'Lintock, near Glasgow, in 1842, applied the following top-dressings on the 13th of May:—

	Grain.	Straw.	Chaff.	Hay crop in 1843.
No application gave	35¾ bush.	92 stones	304 lb.	201 stones
Sulphate of ammonia, 1 cwt.	45⅓ „	120 „	260 „	195 „
Muriate of ammonia, 104 lb.	50 „	140 „	320 „	204½ „
Nitrate of ammonia, 96 „	57 „	161 „	448 „	197½ „
Nitrate of potash, 90 „	60½ „	176 „	320 „	171 „
Nitrate of soda, 90 „	44 „	128 „	352 „	224* „

These results suggest conclusions somewhat different from those of Mr Main. Here the nitrate of potash gave the largest crop, though it was applied in smaller quantity than the sal-ammoniac. The nitrate of ammonia came next, and the sulphate of ammonia produced about an equal effect with the nitrate of soda, in the quantities in which they were in this case applied. There is nothing in these results to lead us to suppose that nitrogen, in the form of nitric acid, is not equally efficacious with nitrogen in the form of ammonia. For while the nitrate of potash beat all the salts of ammonia, that of soda was as efficacious as the sulphate of ammonia, and, alone of all the applications, caused an increase in the after-crop of hay.

3° *On grass cut for hay*, at Barochan, on three separate fields in [illegible]844, the following [illegible] results were obtained:—†

	[illegible]	Lea six years old.	Lea thirty years old.
[illegible] application gave	[illegible]1 [illegible]	[illegible]2½ cwt.	27½ cwt.
Muriate of ammonia, [illegible]	[illegible]	[illegible]8¼ „	38 „
Sulphate of ammonia [illegible]	[illegible]6 „	[illegible]10 „	40 „
Nitrate of potash, [illegible]	[illegible]	57 „	48½ „
Nitrate of soda, 2 [illegible]	[illegible]	51½ „	56 „

* Transactions of the Highland [illegible] Society, January 1849, p. 449.
† Ibid. [illegible] 1847, p. [illegible]

On these grass fields the nitrates were more successful than the salts of ammonia, and in only one of the cases did the muriate exhibit a more favourable influence than the sulphate of ammonia.

4°. Again on grass, M. Kuhlmann made two comparative series of experiments, the first with sulphate of ammonia, and the nitrates of soda and lime; the second with muriate of ammonia and the nitrate of soda. These results were as follows, per hectare:—

a The same plots were top-dressed with equal quantities of the salts in 1844 and 1846, being left without top-dressing in 1845.

		1844.	1845.	1846.	Total increase.
No application gave	. .	3820 kilos.	4486 kilos.	3330 kilos.	
Sulphate of ammonia,	250 kilos.	5564 ...	4170 ...	5193 ...	3291 kilos.
Nitrate of soda,	250 ...	5690 ...	4390 ...	5383 ...	3827 ...
Nitrate of lime,	250 ...	5397 ...	4420 ...	4023 ...	2204 ...

b In his second experiment, equal applications of muriate of ammonia and nitrate of soda were made in 1845 and 1846, to the same plots of the same old grass field, with the following results, per hectare:—

		1845.	1846.	Total increase.
No application gave	. .	7744 kilos.	3519 kilos.	
Muriate of ammonia,	200 kilos. .	9388 „	5576 „	3700 kilos.
Nitrate of soda,	200 „ .	9543 „	4523 „	2803 „

In the former experiment, the increase upon the two years was greater from the application of the nitrate of soda, than from that of the sulphate of ammonia. In the second, though the nitrate produced a large increase, it was surpassed by that which was caused by the addition of the muriate of ammonia.

The experiments brought together in this section present the only data we as yet possess from which we can hope to extract an answer to the question, Whether or not the sensible effect of the salts of ammonia and of the nitrates is in direct proportion to the quantity of nitrogen they respectively contain? I shall examine them in reference to this point in the following section.

§ 8.—*Are the effects of the salts of ammonia and of the nitrates on the quantity of the crop in direct proportion to the quantity of nitrogen they respectively contain?*

The relative proportions of nitrogen contained in the nitrates of potash, soda, and lime, and in the salts of ammonia employed in the comparative experiments, of which the details are given in the preceding section, are represented by the following numbers:—

	Nitrogen per cent.
Sulphate of ammonia contains . . .	21.2
Muriate of ammonia, (sal-ammoniac,) . . .	26.2
Nitrate of ammonia, ...	35.1*
Nitrate of potash, ...	13.97
Nitrate of soda, ...	16.58
Nitrate of lime, ...	17.14

With the aid of these numbers we shall examine the above experiments. They will enable us to test the influence of the nitrogen contained in the several salts employed in them. Having already shown the absolute increase of crop obtained by the use of each, I shall here calculate and exhibit in a tabular form only the increase obtained by the use of each application, supposing the quantity of nitrogen added by it to have been one hundred pounds.

1°. In Mr Main's experiment upon oats, a hundred pounds of nitrogen, in the form of

	Increase for every 100 lb. of nitrogen applied.	
	Grain.	Straw.
Sulphate of ammonia, gave . .	37¾ bush.	7⅓ cwt.
Sal-ammoniac, . . .	47¾ „	14⅓ „
Nitrate of soda, . . .	no increase	none

This experiment lends no support whatever to the opinion that the sensible increase of crop caused by these applications on the same soil has a direct relation to the percentage of nitrogen they respectively contain.

2°. In Mr M'Lintock's experiment upon oats, a hundred pounds of nitrogen, in the form of

	Increase for every 100 lb. of nitrogen applied.	
	Grain.	Straw.
Sulphate of ammonia, gave . .	42½ bush.	124 stones
Muriate of ammonia, . .	52⅓ „	176 „
Nitrate of ammonia, . .	63 „	205 „
Nitrate of potash, . . .	196 „	684 „
Nitrate of soda, . . .	55⅓ „	240 „

In the above numbers, also, there is no similarity, so that we are forced to one of two conclusions—either that the experiments are worth nothing, or that the effect of these applications, when made to corn crops, is not determined by the proportions of nitrogen they respectively contain[illegible]

3°. In th[illegible] [illegible]periments [illegible]pon grass made at Barochan, on [illegible]hree diffe[illegible] [illegible]ields [illegible] [illegible]ndred pounds of nitrogen, in the [illegible]orm of

	[illegible] ery 100 lb. of nitrogen [illegible]pplied.		
	[illegible]	[illegible]°.	3°.
[illegible]	[illegible]	[illegible]½ stones	20½ stones
[illegible]ulphate of [illegible]	[illegible]	[illegible] „	30 „
[illegible]itrate of p[illegible]	[illegible]	[illegible]	70 „
[illegible]	[illegible]	[illegible] „	80 „

[illegible] in the state [illegible] [illegible]ric acid, and one-half in that of [illegible]

Each of these columns represents the effect of a hundred pounds of nitrogen upon the grass of a different field, and there is no more approach to equality among the numbers they respectively contain, than among those by which the effects upon the oat crops were represented above. One might infer from them, however, that the nitrates possess some special virtue independent of the nitrogen they contain.

4°. In Mr Kuhlmann's two experiments upon old meadow grass, 100 kilogrammes of nitrogen, in the form of—

	Increase for 100 kilogrammes of nitrogen.
Sulphate of ammonia, gave . . .	6094 kilogrammes.
Nitrate of soda, ...	9232 ......
Nitrate of lime, ...	5143 ......

And, in his second experiment,

Muriate of ammonia gave . . .	7061 ......
Nitrate of soda, ...	8453 ......

Nor, from these experiments, can we venture to say either that like quantities of nitrogen produce like effects in like circumstances, or that the comparative effects which two substances may be expected to produce are to be measured by the proportions of nitrogen they respectively contain.

We may safely admit, I think, that each of the salts of ammonia, and each of the nitrates, exercises a special and peculiar action upon vegetation—that this action is generally a favourable, often a profitable one—and that the action of each of these compounds is probably different in the case of different plants, and is modified also by climate, season, soil, locality, and other circumstances. To make out the several special actions of these compounds, and the modifying influence of circumstances, will require many carefully conducted and skilfully contrived experiments.

§ 9.—*Influence of the state of chemical combination in which the nitrogen exists in a substance on its efficacy as a manure. Comparative experiments with gelatine, rape-cake, and sulphate of ammonia, on the weight of the crop.*

The comparative experiments with the salts of ammonia and with the nitrates—which I have analysed in the preceding section —appear to justify our conclusion that each compound exercises an action special to itself, and to reject the opinion that the proportion of nitrogen in such fertilising substances determines the amount of their sensible action upon the crop.

But we have other experiments also, the results of which tend to establish the general principle that the state of chemical combination in which the nitrogen exists, in any substance, influences very

much its sensible effect upon a crop. Gelatine and rape-cake contain nitrogen, the former in large proportion, and both promote vegetation in a striking degree. But the fertilising effect of this nitrogen is materially affected by the state of combination in which it exists in them respectively. This is very distinctly brought out (§ 4) by the three series of experiments which I shall here introduce.

1°. *With gelatine compared with nitrate of soda and sulphate of ammonia upon grass.* Along with the other substances employed in his experiments upon hay, Kuhlmann tried also the gelatine of bones. This was obtained by boiling bones in the process for extracting the fat, before burning them for the manufacture of animal charcoal. It was applied in the liquid form, at the rate of 500 kilogrammes of the dry gelatine to the hectare, or 4 cwt. per acre. The applications were made in 1844 and 1846, the plots being undressed in 1845. In the following table the results, per hectare, are thrown into a comparative form:—

	Quantity applied in the two years.	Nitrogen per cent in the manure.	Nitrogen applied per hectare.	Increase of hay in the three years.	Increase for 100 kilos. of nitrogen.
Sulphate of ammonia,	500 kilos.	21.2	106 kilos.	3291 kilos.	3105 kilos.
Nitrate of soda, .	500 ...	16.6	83 ...	3827 ...	4610 ...
Nitrate of lime, .	500 ...	17.1	86 ...	2204 ...	2562 ...
Gelatine, . .	1000 ...	17.0	170 ...	4866 ...	2862 ...

The last column shows an approximation among the comparative effects of gelatine, sulphate of ammonia, and nitrate of lime. Whether this indicates a real or only an apparent similarity of action in these substances, must be cleared up by future experiments.

2°. *With rape-cake compared with sulphate of ammonia upon turnips.* Mr Lawes has published the results of comparative experiments with these substances applied singly and together, to a crop of Norfolk white turnips, grown upon his farm in Hertfordshire in 1845. They were as follows. (Rape-cake contains about 4½ per cent of nitrogen.)

	Bulbs.		Tops.		Nitrogen applied per acre.
	tons.	cwt.	tons	cwt.	lb
1°. Nothing gave . . .	—	13½	—	14½	—
2°. Farm-yard manure, 12 tons,	17	—	7	7	—
3°. Rape-cake, 8 cwt. . .	4	16	4	5	38
4°. ...... 18 cwt. . .	9	8½	8	9	80
5°. ...... 8 cwt. . . Sulphate of ammonia, 3 cwt.	5	8½	4	6	110
6°. Rape-cake, 18 cwt. Sulphate of ammonia, 3 cwt.	8	—	7	18	152
7°. Sulphate of ammonia, 6 cwt.	3	4	1	14	142

a It is interesting to observe how very much larger a proportion of tops, compared with the bulbs, the rape-cake produced than any of the other applications, even than the farm-yard dung.

b But what more particularly concerns our object is the total want of connexion between the comparative weights of tops, or of bulbs, or of both taken together, and those of the nitrogen contained in the different applications. Take, for example, the total weights of the crops, (tops and bulbs,) and the following table shows how much was produced in each experiment by 100 lb. of nitrogen:—

	Total produce.		Total nitrogen applied.	Produce for 100 lb. of nitrogen.	
	tons.	cwt.	lb.	tons.	cwt.
1°.	1	8	—	—	—
2°.	24	7	—	—	—
3°.	9	1	38	23	16
4°.	17	17½	80	22	7
5°.	9	14½	110	8	17
6°.	15	18	152	10	4½
7°.	4	18	142	3	8⅓ *

Here we see three things deserving of notice; *first*, that the rape-cake gave a much greater increase, in proportion to the nitrogen it contained, than the sulphate of ammonia; *second*, that the addition of sulphate of ammonia actually diminished the natural effect of the rape-cake in No. 6, compared with No. 4, in both of which cases 18 cwt. of rape-cake were applied; and *third*, that the sensible effects of the rape-cake when used alone in the two experiments, Nos. 3 and 4, was nearly in proportion to the quantity applied.

c The opinion entertained by some writers on this branch of science—that the nitrogen contained in rape-cake and other organic substances only becomes valuable or available to plants when it is decomposed and converted into ammonia in the soil or elsewhere—is inconsistent with—we may say, is directly contradicted by—the above experiments. If one hundred pounds of nitrogen, already in the form of ammonia, (in the sulphate of ammonia,) produced in the seventh experiment only 3 tons 8 cwt., while an equal weight, in the form of rape-cake, produced 22 or 23 tons, it is clear that some other virtue yet unrecognised must reside in the constituents of rape-cake. And if in this, similar virtues may reside also in other organic substances, of which nitrogen forms a constituent part.

3°. *With rape-cake, compared with sulphate of ammonia, upon wheat.*—In 1846, Mr Lawes employed these substances in comparative experiments upon wheat (old red Lammas variety) sown upon a piece of exhausted land, to which no manure had been previously applied, with the following results:—

* In calculating this column, I have not thought it of consequence to deduct from the produce of the dressed portions the small crop yielded by the part to which nothing was applied.

	Grain	Straw	Total produce.
	bush. lb.	lb.	lb.
1°. No manure gave	17½ or 1216	1455	2671
2°. Rape-cake, 4 cwt.	23¼ or 1614	2033	3647
3°. Sulphate of ammonia, 2 cwt.	27¼ or 1850	2244	4094
4°. Rape-cake, 4 cwt. Sulphate of ammonia, 2 cwt.	28¾ or 1942	2603	4545

The small comparative effect of the two substances, applied together in the fourth experiment, is striking enough; but the bearing of the whole results upon the influence of the nitrogen will appear more clearly by showing the increase in each case for a hundred pounds of nitrogen in the manure.

	Total nitrogen applied.	Increased produce for 100 lb. of nitrogen. Grain.	Straw.	Total.
	lb.	lb.	lb.	lb.
2°.	19½	2041	2964	5005
3°.	47¼	1335	1661	2996
4°.	67	1083	1713	2796

The rape-cake used alone, in the second experiment, gave an increased produce both of grain and straw more than one-half greater in proportion to its nitrogen than the sulphate of ammonia, when applied alone, in the third experiment. And, when the two substances were used together, the produce of the grain was still less from a hundred of nitrogen than when the sulphate was used alone.

In so far, therefore, as the experiments detailed in the present section are worthy of reliance—and in the absence of duplicate trials, we must not rely too confidently upon them—it appears that the sensible effect of an organic substance containing nitrogen on the quantity of a crop to which it is applied, is by no means indicated by the proportion of nitrogen it is known to contain. We saw reason in the preceding section to conclude that such was the case, also, with the salts of ammonia when compared with each other, and with the nitrates compared among themselves, or with the salts of ammonia. It is, therefore, probable, that every substance which contains nitrogen exercises upon growing plants an action peculiar to itself in quality and in intensity. The nature and amount of this special action can only be made clear by further experiments specially directed to this end.

§ 10.—*Influence of the quantity of nitrogen, and of the state of chemical combination in which it exists in a fertilising substance, on the quality of the crop to which it has been applied.*

But if the quantity of a crop is not directly as that of nitrogen in the manure, is not the quality determined by the amount of nitrogen applied to the land? This opinion was formerly entertained, but it will not bear the test of rigorous investigation. I have elsewhere discussed this subject;* but some

* [illegible] *Agricultural Chemistry*, 2d edition, p. 874.

experiments of Mr Lawes, similar to those described and discussed in the previous sections, throw some additional light upon it.

1°. *Experiments upon turnips.*—He drilled in certain mineral manures with the seed over the whole field; he then top-dressed different parts of it with rape-dust, sulphate of ammonia, and a mixture of the two. When the crop was gathered, the proportion of nitrogen in the turnips grown upon each plot was determined as nearly as possible by repeated analyses. The numbers in the following table represent the total produce, and the percentage of nitrogen in the dry turnip bulbs, produced by the aid of the different manures:—

Drilled Manures.	Drilled manures only.	Drilled and top-dressed with 10 cwt. of rape-cake.	Drilled and top-dressed with 3 cwt. sulphate of ammonia.	Drilled and top-dressed with 10 cwt. rape-dust and 3 cwt. sulphate of ammonia.
	tons. cwt.	tons. cwt.	tons. cwt.	tons. cwt.
1°. Calcined bones, 400 lb., dissolved in muriatic acid,—				
Total produce, tops and bulbs,	13 15	13 19	13 16	13 5
Nitrogen, per cent, in dry bulbs,	1.46	1.93	2.82	2.22
2°. Superphosphate of lime, 11 cwt.,—				
Total produce, . . .	17 1	20 9	16 9	19 18
Nitrogen, per cent, in dry bulbs,	1.58	1.89	2.89	2.44
Nitrogen applied per acre, .	none	42 lb.	71 lb.	113 lb.

a The last line of this table, compared with the first and third, shows that the proportions of nitrogen applied had no sensible relation whatever to the total weights of the crops produced. This agrees with the deduction we drew in the preceding section.

b As to the quality of the crop, as indicated by the proportion of nitrogen in the bulbs, it appears that it increased in all the experiments till the quantity of nitrogen per acre reached 71 lb., but that it diminished when the quantity amounted to 113 lb. per acre. Still, the increase in the two cases—when 42 and 71 lb. were applied respectively—was by no means in proportion to the quantity of nitrogen applied.

All we can safely infer, therefore, from these experiments is, that substances containing nitrogen, even when they add nothing to the weight of the turnip crop, may improve its quality by adding largely to the proportion of nitrogen contained in the bulbs. According to what law this increase takes place, or whether, as in the case before us, nitrogen in the form of ammonia improves the quality more than it does in the form in which it exists in rape-cake or other organic substances—these are points which can only be made out by further experimental investigation.

2°. *Experiments upon wheat.* In 1844, Mr Lawes top-dressed

one portion of his wheat with superphosphate of lime and another with ammoniacal salts, and in the dried grain reaped from the two plots, he found the percentage of nitrogen to be, from the

Superphosphate of lime, ...	3.03 per cent.
Ammoniacal salts, ...	2.65 ...*

From which it would appear that the application of the ammoniacal manure had diminished instead of increasing the proportion of nitrogen in the grain.

Again, in 1846, he caused the percentage of nitrogen to be determined in the grain reaped from experimental plots to which he had applied respectively rape-cake, sulphate of ammonia, and a mixture of the two. A general view of his results is presented in the following table:—

Kind of manure applied.	Total produce of grain.	Total nitrogen applied per acre.	Nitrogen per cent in the grain.
No manure, . . .	17½ bush.	... lb.	1.95
Rape-cake, 4 cwt., . .	23½ ...	19½	1.85
Sulphate of ammonia, 2 cwt.,	27¼ ...	47½	2.01
Rape-cake, 4 cwt., . . } Sulphate of ammonia, 2 cwt., }	28¾ ...	67	1.93

Here, though the crop was increased—not, however, in proportion to the nitrogen applied—the nutritive quality, as indicated by the percentage of nitrogen, may be considered to have been sensibly the same throughout. The numbers show a slight diminution of nitrogen in the rape-cake grain, and a slight increase in that top-dressed with sulphate of ammonia, but the differences are small enough to be within the limits of the ordinary errors of analyses.

On the whole, therefore, it would appear, from the experiments detailed in this section—

1°. That the nutritive quality, as indicated by the proportion of nitrogen, may be increased in the bulbs of turnips, and probably in other roots, by the use of manures rich in nitrogen—though what relation the increase bears to the quantity of nitrogen applied, or to its state of chemical combination, does not appear.

2°. That manures containing nitrogen do not sensibly augment the proportion of nitrogen in the grain of wheat crops to which they have been applied. In some cases they rather appear to diminish it.

It is to be remembered, however, that there is a great difficulty in ascertaining the average chemical composition, especially of a

* See Royal Agricultural Journal viii., p. 235 and 248.

crop of turnips or other roots; and therefore that, for this and other reasons, our confidence in the above conclusions ought not as yet to be very decided.

§ 11.—*Suggestions for experiments with the carbonate, nitrate, muriate, and sulphate of ammonia.*

A perusal of the experimental results embodied in this paper must already have suggested, both to the theoretical and to the practical reader, many interesting comparative trials with the salts of ammonia. I shall put down here, however, such as appear to me, in the present state of our knowledge, to be most important.

1°. It is desirable to ascertain more correctly the comparative influence of the different salts of ammonia, applied in equivalent quantities to the same crop, in the same circumstances.

Of course, this means that the crop experimented upon should be varied until the comparative effects of all these salts on each of our usually cultivated crops is ascertained.

2°. With the same salt applied in different quantities at different times—all at once, and in successive portions at successive periods.

Does the produce increase directly with the quantity applied? Is it influenced by the time of applying it, by the weather, by the soil, &c.?

3°. Is the sulphate most favourable to leguminous crops, as other sulphates are supposed to be? Are the onion and the cabbage especially influenced by it?

4°. To the scientific agriculturist, the nitrate and the muriate may be especially commended. Do they equally favour any given crop? Are their actions equally affected by dark and by bright or sunny weather? Does the nitrate or the sulphate more especially demand the presence of the sun?

5°. Are their effects always more favourable on light and open than upon stiff clay soils? May they not be profitably used on all young crops on any soil, when the crops are yellow, sickly, and stunted in their growth?

6°. Are they especially indicated for use on *deaf* soils, or such as contain much inert vegetable matter—on such as are poor in organic matter—on soils newly trenched or turned up from a depth, and so on?

7°. Can they be used with safety for any and for what crops, on soils which have already a tendency to produce a large growth of straw or of tops?

8°. Is a crop of any kind increased by different doses of the same salt, in proportion to the quantity of nitrogen applied? Are the comparative effects of two different salts directly or otherwise proportional to the quantity of nitrogen they severally contain? If not generally, is this the case in regard to any one

crop in any given circumstances? These questions have been discussed in the preceding sections, and all the field results we at present possess seem to answer both questions in the negative.

9°. The nitrogen in the nitrate of ammonia is in two states—partly in that of nitric acid, partly in that of ammonia. Are both these forms of nitrogen equally efficacious in this or that circumstance—of soil, weather, plant, or period of growth? Will a nitrate of potash, soda, or lime, which contains as much nitric acid as the nitrate of ammonia, produce an equal effect with this salt of ammonia upon any plant in any circumstances? Will a sulphate or muriate of ammonia, containing as much ammonia as the nitrate of ammonia, produce an equal effect? These are curious questions, neither of which will probably be answered in the affirmative when careful field experiments are made, but the investigation of them may conduct us to important practical truths.

10°. Do the salts of ammonia add to the nutritive quality of a crop? This question is to be solved by experiments in feeding with the crops raised by means of the salts of ammonia, and by analysing them in the laboratory. The former method is in the power of the practical man, and is deserving of much attention.

This general question includes several subordinate ones, such as—

a Do they add to the richness of grain in gluten, as some have said? This we have elsewhere seen to be very doubtful; but the question is by no means decided.

b Do they increase the feeding quality of root-crops and cabbages? The comparative feeding quality is represented pretty nearly by the proportion of nitrogen contained in the crops we raise, and this proportion appears capable of material increase by the use of the salts of ammonia, and of rape-cake. The details of Mr Lawes' experiments upon two crops have been given in a preceding section.

c Is the more succulent grass of fields, top-dressed with salts of ammonia, more nutritious also, weight for weight? This is a question which the feeder, as well as the chemist, is required to solve.

d As to the function of the ammonia, does it directly supply nitrogen to the crop at all, or does it act in some other way? This question is more purely theoretical, though of great practical consequence.

11°. In conclusion, I may suggest the importance of comparative experiments between the nitrates of potash, &c., and any of the salts of ammonia. If they be applied in equivalent quantities, or two equivalents of the one against a single equivalent of the other, accurate duplicate experiments made upon any crop will afford valuable data for the solution of existing theoretical and practical difficulties.

§ 12.—*Suggestions for experiments with the acetate, oxalate, and humate of ammonia.*

The composition of these three salts has been given in a preceding section.

1°. *Acetate.* The acetate of ammonia has been said to be poisonous to growing plants. The same has also been stated by Bouchardat of the carbonate, sulphate, muriate, &c. But extended experience in this country has shown the latter to be incorrect. It would be interesting, therefore—it is necessary, in fact, to the satisfactory clearing up of this point—that experiments should be made with the view of ascertaining the special nature and the extent of the action, of the acetate, compared with that of equivalent quantities of the other salts of ammonia.

2°. *Oxalate.* As the oxalic acid occurs abundantly in plants, it is desirable that its influence upon their growth should be ascertained. Though, in the first instance, this is a theoretical inquiry, yet it is not without a practical bearing.

Certain soils produce the sorrels (*Rumex acetosa and acetosella*) in large quantities, and the addition of lime to such soils extirpates these plants. Does oxalic acid exist in such soils? will the application of a soluble oxalate favour the growth of those plants in which oxalic acid is found or formed in any considerable quantity? How will the ammonia and the oxalic acid contained in oxalate of ammonia modify the action of each other?

With the view of obtaining answers to these questions, it would be desirable to institute comparative duplicate experiments with the carbonate of ammonia, with oxalic acid, and with oxalate of ammonia. For though, where there is lime in the soil, the oxalic acid would probably unite with it to form the insoluble oxalate of lime, before it had an opportunity of entering into the roots of plants, still it may not be incapable, even in that state of combination, of modifying the plant's growth, and of throwing light upon the nature of its chemical influence upon vegetation.

3°. The *humate.* It is a disputed point at present among chemical physiologists how far the dark-coloured acid substances (the humic and ulmic acids) contained in the soil contribute directly to the growth of plants. It cannot be doubted that the largest proportion of the organic matter of the soil is derived from the air, through the instrumentality of vegetables that have lived and died upon it. But does this organic part of the soil serve no direct purpose in feeding and nourishing the plant? That it should do so is quite consistent with the fact of the plant's drawing a large proportion of its carbon from the air. But this question would be helped towards a satisfactory solution if experiments were made.

a With carbonate of ammonia in different proportions, applied in different ways, and under different circumstances.

b With humate of ammonia alone, and in comparison with the carbonate of ammonia, upon the same crops, and in the same circumstances. These would show whether and to what extent the humic acid modified the action of the ammonia.

c With humate, in comparison with sulphate or muriate of ammonia. These would show how far the mineral sulphuric or muriatic acid acted in a similar way with the humic acid—how far the presence of the organic acid did or did not promote the more rapid and healthy growth of the plant.

Though the results obtained by means of these comparative experiments may not be wholly free from doubt and ambiguity, yet they will form a valuable basis for future field inquiries.

§ 13.—*Suggestions for experiments with the phosphate of ammonia, with the ammoniacal phosphate of soda, and with the ammoniacal phosphate of magnesia.*

1°. The *phosphate of ammonia* described in a preceding section is likely to prove a very powerfully fertilising substance. Being capable of supplying both nitrogen and phosphorus to the plant, it may be expected to produce a very sensible action upon its growth; and as it may be manufactured easily, it is desirable that field experiments should be tried with it applied alone.

a In different proportions, at different seasons, and to different plants.

b In comparison with the other salts of ammonia, and especially with the sulphate, under similar circumstances.

The reason for particularly specifying the sulphate, is that the sulphuric acid possesses many properties which approach to those of the phosphoric acid, and may, therefore, in the interior of the plant, perform chemical functions of a similar kind.

The phosphate of ammonia is not here recommended for the first time. It has already been tried, along with other substances, by Mr Lawes, on the turnip crop of 1844, as follows:—

No manure gave, of bulbs,	2 tons 4 cwt.
Farm-yard manure, 12 tons,	10 ... 15 ...
Superphosphate of lime, 4 cwt., Phosphate of ammonia, 56 lb.,	6 ... 18 ...
Superphosphate of lime, 4 cwt., Sulphate of ammonia, 56 lb.,	5 ... 10 ...
Superphosphate of lime, 4 cwt., Rape-cake, 4 cwt.,	7 ... 0 ...*

As we have no experiment with the superphosphate applied alone, the above results—if we may rely upon crops of bulbs, which are so very small—merely indicate that the phosphate of ammonia, under the circumstances, produced an effect about equal to that of eight times its weight of rape-dust, and something greater than

* Journal of the Royal Agricultural Society, vol. viii. p. 510.

that of its own weight of sulphate of ammonia. They urge as strongly, however, to further more comparative and duplicate experiments with these several substances applied alone.

2°. *Ammoniacal phosphate of soda.* — This salt is formed by dissolving together in hot water six or seven parts of the common phosphate of soda of the shops with one of sal-ammoniac, and setting the solution aside to cool. It crystallises in large transparent prisms, which possess a cooling saline taste, effloresce slightly in the air with loss of ammonia, and dissolve readily in water. They consist of—

Ammonia,	8.11	per cent.
Soda,	14.89	...
Phosphoric acid,	34.06	...
Water,	42.94	...
	100.	

The equivalent weight of this salt is 262.

The presence, in this compound, of ammonia, soda, and phosphoric acid, three substances very necessary to plants, make it desirable to ascertain, by comparative trials, its special effects upon vegetation.

a Alone, applied in different quantities under different circumstances, to different crops, and on different soils.

b In comparison with the several substances of which it consists, with the view of eliminating, as far as possible, the special effects or influence of each. In these experiments, the effects produced respectively by the carbonate of ammonia, the phosphate of ammonia, the carbonate of soda, and the phosphate of soda, on separate portions of the same field and crop, if carefully observed and noted, would afford us the means of drawing very probable deductions.

3°. *The ammoniacal phosphate of magnesia* is produced during the fermentation of human urine, and falls as a white crystalline powder when a solution of sulphate of magnesia is mixed with one of phosphate of ammonia, or of the ammoniacal phosphate of soda. It is sparingly soluble in water, and consists of—

Ammonia,	6.9	per cent.
Magnesia,	16.3	...
Phosphoric acid,	29.1	...
Water,	47.7	...
	100.	

Its equivalent number is 307.

All the constituents of this salt are necessary to the growth of plants. Independently of any supposed special action of the salt as a chemical compound, there is reason, therefore, to anticipate very striking effects from its application to growing plants. This anticipation has been so far verified by an experiment of M. Boussingault. He treated young plants of maize with this substance,

to the extent of about half-an-ounce for each plant, and found that not only did they grow faster and larger, but that, while plants to which no phosphate had been applied produced one perfect and one abortive head, those which had been treated with it produced two perfect and one abortive head, and the grains were also double those of the others in size. This encouraging result suggests the propriety of further and more enlarged experiments.

a On corn-crops of different kinds, under different circumstances, and applied in different quantities.

b On root-crops, and especially on the potato, for which salts containing magnesia are alleged by some to be specially adapted.

c In comparison with equivalent quantities of carbonate of ammonia, carbonate or sulphate of magnesia, and phosphate of ammonia. These comparative trials will throw some light on the part which is performed by each of the constituents in bringing about the result which the compound salt is observed to produce.

THE FARMERS' NOTE-BOOK.—NO. XXV.

On Practical Ventilation and Heating, as applied to Stables, Cow-houses, and Grain Drying-houses. By R. S. BURN—In our previous article on ventilation in the last number of this Journal, we gave concise rules for carrying efficient plans for public buildings and private apartments into effect. We now intend to devote the present pages to the elucidation of plans for the ventilating and heating of stables, &c.; and if, in the consideration of these, we devote a little space to the mentioning of other arrangements, which may be considered foreign to the subject, we do so from the belief that the plans recommended will be of some use to those having an interest therein. And first as to stables, cow-houses, and similar buildings. A proper supply of fresh air is as necessary to the health of the inferior animals as it undoubtedly is to man. Baneful as is the influence of impure air on the constitution of human beings exposed to its influence, it is no less so to the valuable animals, the horse and the cow. Many are the diseases which affect our domestic animals, brought on by exposure to foul air; and many a valuable animal is sacrificed to close and ill-arranged stables, &c.

The rules formerly given for ventilating public buildings may here be advantageously employed; doubtless, some alterations in the arrangements may be necessary, but, generally speaking, the rules given will in almost all cases be found to apply, with the exception of that for ascertaining the size of ventiducts. The quantity of air breathed by a horse may be assumed to be three times as great as that required for a man. On this assumption, the quan-

tity used per minute will be 12 cubic feet; this will require to be the multiplier, then, instead of 4 as given. The rule for stables will stand thus:—Multiply the number of horses the stable is to contain by 12, and divide this product by 43 times the square root of the height of the tubes in feet, and the quotient is the area of the ventilator tube or tubes in feet. 12 cubic feet may be found to be more than a horse in ordinary health may require, but we think it better to err in excess than deficit. The same quantity may be given for cows.

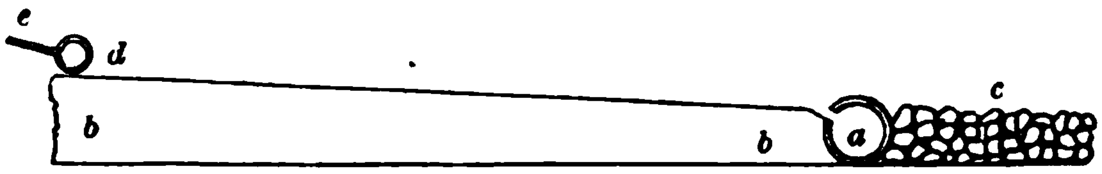
We conceive that, in the construction of a proper stable or cow-house, four points are necessary to be considered. These are,—1. Sufficiency of space in the stalls; 2. Proper methods of ventilating and heating; 3. Proper drains and reservoirs by which all exuviæ can at once be carried off, (so as not to vitiate the air in the interior,) and in which they may be collected and preserved for manure; and, 4. A properly arranged series of water-pipes and a reservoir, so as to be available for clearing the whole range of stalls, and to provide a supply for the animals' use. Passing over the first as sufficiently obvious, although important to be remembered, and the second as already partially treated of, we will give a few hints in connexion with the two last.

We would recommend all the stalls to be made sloping at a certain angle from the head towards the foot. At the bottom part of the incline, a pipe or covered drain should be placed in front, running along before all the stalls, and should have a considerable fall or incline throughout its whole length, towards a convenient part of the building, where it should communicate with a larger pipe or covered drain, which should lead to a reservoir for liquid manure placed at the back of the building. The liquid manure will flow down this to the reservoir.

As the liquid collected from the stalls forms a very excellent manure, it is of importance that proper methods should be adopted for collecting and preserving it. As a most effectual means, we recommend the power of running water to be used in the following way. The floor of the stall should be made of asphaltum, or closely flagged (not with small stones, as dirt collects between the interstices.) An iron pipe of the breadth of the stall, and closed at the ends, should be placed at the head of each stall; its under side pierced with small holes, or, what will be better, a slit or small aperture stretching nearly across its whole length. This pipe should communicate with a cistern or reservoir placed at a level considerably above that of the stalls. The coarse litter and solid manure (when the stalls are wished to be thoroughly cleaned, and the manure in the pipes to be flushed down into the reservoir) being removed, the communication between the pipe at the head of the stall and the water cistern is opened, and a thin but powerful stream of water is projected down the inclined plane of the stalls,

carrying along with it all impurities, and the manure in the pipes, to the reservoir. If the stream is continued for any length of time, to sweeten the stalls, the accession of water to the contents of the reservoir might deteriorate the manure. To provide a remedy for this, let a pipe or drain be connected with the drain running before the stalls, to a cesspool independent of the reservoir. This pipe should be provided with a stop crane or other means for shutting off communication; the same should be applied to that leading to the reservoir. By shutting the stop-crane leading to the reservoir, and opening that to the cesspool, the water will run thereto, and *vice versa*. Fig. 1 illustrates the incline of the stall and position of drains; *b b* is the stall, *c* the floor of the stable, *a* the drain running before the stalls, *d* the water-pipe, *e* the pipe of communication leading to the reservoir.

Fig. 1.



We would recommend the cistern containing the water to be placed at the roof of the building. If the source from which the water is obtained be a lower level than that of the roof, the water may be pumped up to the cistern from a supply below. And we would here draw the attention of farmers to the important means for preventing fires thus put in their possession by adopting such a plan as here recommended. For, by leading pipes from the cistern to convenient places in the walls, in the interior of the building, and finishing them there with screw-cocks, to which leathern hose, furnished with nozzles, may be attached when necessary, a powerful stream of water may be directed to any part of the interior required. For application to the *exterior*, pipes should be led to spaces made on the ground, on each side and end: from these, hose could be led to act upon any part. It will be evident also, that such a plan will be valuable for the cleaning of windows, &c., within and without the building. Moreover, should the building so furnished with a high level cistern, be near the *house* and offices, and at a higher level, the supply of water might be available for extinguishing fires there.

Before giving our plans for the construction of drying-houses, it will be necessary to make a few remarks on the application of heat to the warming of buildings. Plans for the *heating* of buildings have often assumed a degree of complexity and difficulty when applied alone, but become simple and easy when attempted in connexion with ventilation. Indeed, a writer on the subject remarks, and with truth, that unless a building is well ventilated, no plan of heating can be adopted with success. This is evident when we consider that such plans depend for their efficiency upon the establishment of movements and currents of air in the interior

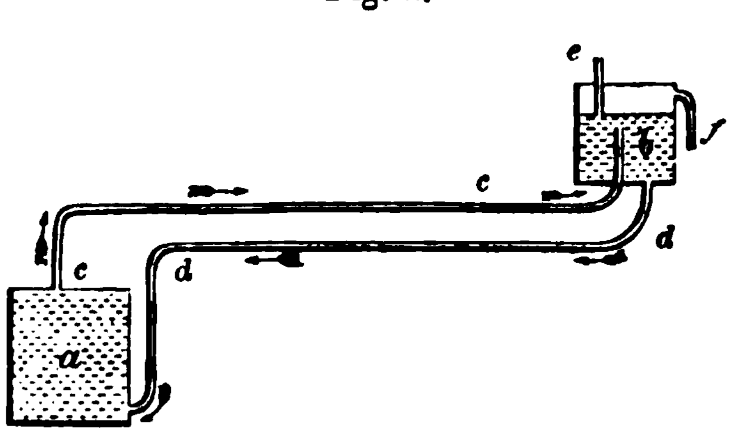
of the buildings in which they are placed. While recommending the reader, unacquainted with the nature and phenomena of heat, to study its interesting peculiarities, we will at once proceed to the more immediate consideration of our subject.

The plans hitherto in use for heating large spaces are as follows:—Hot furnaces, steam, and hot water. In the first, plates of metal, or masses of brick and stone, or flues, are heated in and by a furnace, and the air to be supplied to the interior is caused to impinge upon or pass through these, thus imparting a degree of heat, which it is evident cannot be controlled or regulated as required. Moreover, from the fact of the surfaces over which it is made to pass being often overheated, the air is burnt or desiccated; that is, deprived of its inherent moisture, consequently causing it to have an unhealthy action on the bodies of those subjected to its influence. Steam and hot water, as used for the purpose of heating, are caused to pass through a congerie of pipes, which heat the air surrounding them, by a combination of the two modes by which heat is derived from heated bodies, namely, radiation and contact. Passing over the first mode mentioned, as not only being expensive in its construction and *operation*, but from its incapability of being controlled so as to produce the degree of heat required, we will notice the peculiarities of these two, steam and hot water, which, in the generality of cases, are now adopted.

Steam is generated in a boiler, and sent through the range of pipes arranged in number and situation as required, the water of condensation either returning to the boiler, or led to a convenient place. The hot-water system is divided into two classes, "low" and "high" temperature. The former consisting of a congerie of pipes communicating with a boiler or receptacle placed at a lower level, to which the fire is applied, a receptacle at the highest part or extremity of the pipes is placed, into which the waste water caused by the expansion runs: this is open, and, consequently, being exposed to the atmospheric pressure, the water cannot attain to a higher temperature than that of boiling water, 212°. In the "high" temperature, the pipes are *hermetically* sealed after the water is put in, space being allowed for the expansion; and by continuing the heat of the fire, a high degree of heat, far above 212°, is attainable. The heat from steam or hot water pipes may be applied in two ways, either by placing a congerie of pipes in an apartment distinct from the building to be heated, and causing the air to pass between these; thereafter, in a heated state to be passed into the interior, through apertures in such cases provided—or by placing the pipes in the interior of the building, and connecting these with a boiler situated in a distinct apartment—at or below the building to be heated. Of the two methods we decidedly recommend the former. As to the comparative merits of the two systems, we cannot find space to enter into a long discussion. But

as the result of some experience, we would decidedly recommend farmers to adopt the low temperature hot-water system. Steam undoubtedly possesses the advantage of a ready means of preparing mashes and boiling water in a very short time; but to set against this, the steam often not being readily raised when required, and from the time taken up in doing so, to keep steam apparatus in continual action, involves a very considerable degree of attention and outlay of fuel, while in that of the hot water a very small fire will maintain a considerable degree of heat for any length of time. "As contrasted with steam heat," says a writer on the subject, "it may be remarked, that the extreme simplicity of the hot water apparatus, and its freedom from those casualties which are incident to an accumulated temperature in steam, renders it a desirable means for adoption in domestic economy; for while, on the one hand, heating by steam necessarily involves liability to accident from the increased ratio of the force of vapour as compared with that of its sensible heat, and which is frequently occasioned by the derangement either of the feeding or the safety apparatus; on the other hand, by the substitution of hot water, this serious inconvenience is avoided, while the expenditure of the water is in this latter mode no greater than the quantity lost from leakage; or the slight evaporation which can occur, is limited to the effect of over-firing, by which water may be driven out of the upper part of the pipes, or from the feed cistern of the apparatus, into the channel provided for its escape, so as to produce for a short interval a reduction in the temperature of the remaining quantity by the immediate influx of cold water, from the source to supply the deficiency thus occasioned." Fig. 2 illustrates the rationale of this process, where

Fig. 2.



a represents the boiler, *b* the feed cistern, *c c* the ascending or hot pipe, *d d* the descending or supply pipe. The water from the feed cistern descends the pipe *d d*, and fills the interior of the boiler *a*; by the action of the fire, the temperature of the water is raised, and, according to the laws which regulate the motion of hot fluids, it flows up the pipe *c c* to the cistern *b*. A regular and unintermitting descent of cold water down the pipe *d*, and hot water up the pipe *c c*, as indicated by the arrows, goes on until the temperature of the whole body of water is the same. Properly speaking, this scarcely ever happens, as a portion of the heat is abstracted from the pipe *c c* by radiation and contact: the motion may be said to be continual so long as the fire is maintained. The feed cistern *b* is supplied with cold water by the pipe *e*, and a waste pipe, *f*, is provided to allow any water of expansion to escape. As the pipes in this apparatus are always open to the

atmosphere, any steam or vapour generated can easily escape. It will be evident that in this apparatus the heat can never exceed that of boiling water, 212°. If the feed cistern is at a considerable elevation above the boiler, as the pressure in the water therein is greater than ordinary, the boiling will vary in proportion to the height. Thus in an apparatus in which the boiler is 60 feet below the cistern or highest part of the pipes, the boiling point is 270° instead of 212°, and the mean temperature of the circulating pipes will in such a case be 185°. To obtain a supply of hot water for the preparation of mashes, &c., a stop crane may be attached to the ascending pipe *c* at or near to the boiler; and by shutting this, all circulation through the pipe *c* will be stopped, consequently confining it to the pipe *d* between the cistern and the boiler. To prevent all loss of heat by abstraction from the pipes, boiler, and cistern, all the parts of the pipes from which heat for useful purposes is not to be taken, should be covered with a non-conducting material: a covering of felt, well wrapped round with cord, will answer well. The boiler should have an iron case fitted to the part exposed to the open air; and, between the spaces, charcoal or other non-conducting substance should be placed. The cistern should be provided in the same manner with a case. We have dwelt for some length in the description of this apparatus, as, by the proper understanding of it, the reader will have no difficulty in understanding the rationale of any low-temperature heating apparatus, however apparently complicated in its arrangements; nay, more, will be enabled to superintend the construction of one, should he be required to do so: as, however apparatus may vary in their arrangements, the principles which regulate the action, in all cases, is the same. The cause of the circulation of the hot water in pipes is produced by the "unequal density of the fluid, arising from the difference of temperature in the ascending and descending columns of water connected with the heating reservoir; and its velocity is governed by the height of the columns."

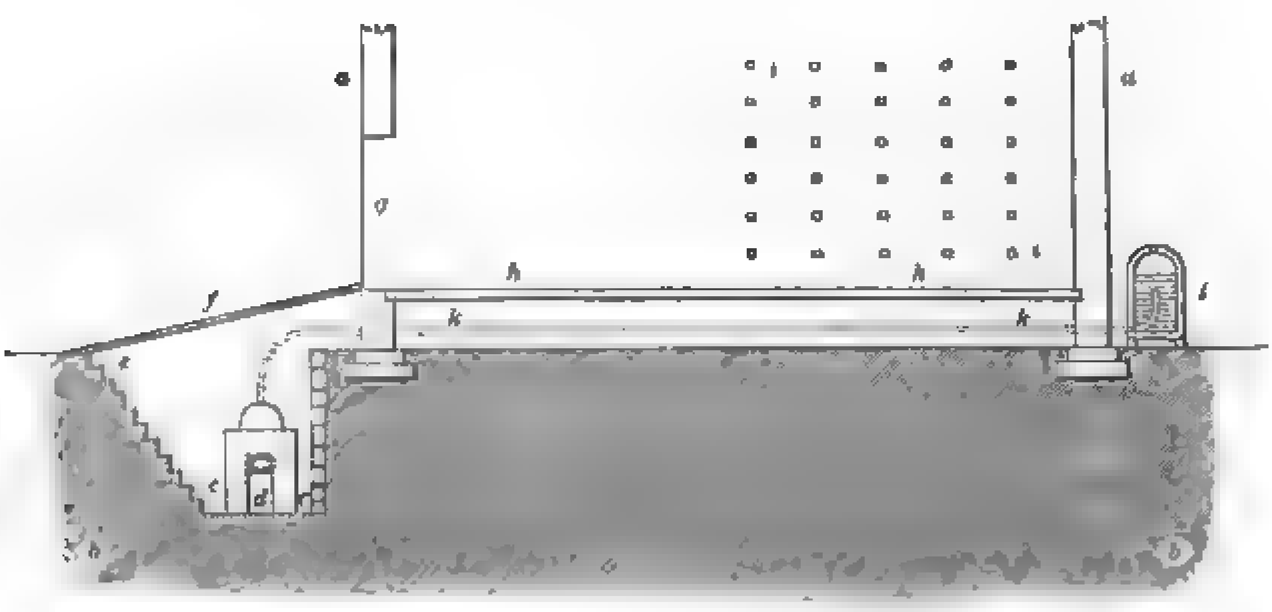
In the construction of drying-houses for grain, &c., attention should be paid to two things—first, the nature of the principles which regulate the drying process—and, secondly, the mode of arranging the substances to be acted upon, so as to present them in the most favourable position to the action of the drying agent.

All drying consists in applying such a degree of heat as will convert the moisture contained in the substances to be operated upon into vapour, and in taking advantage of the affinity that air has for moisture. This affinity is increased by raising the temperature of the air, thereby producing an effect equivalent to a diminution of atmospheric pressure, which very much facilitates the removal of the inherent moisture. It should be remembered, however, that, "though air has affinity for moisture, it can absorb it only in the state of vapour; and, therefore, as much heat as will

convert all the water in the goods into vapour, will still be required besides that necessary to heat the air—the action of the air's affinity being chiefly effectual in accelerating the process of drying." Houses for drying grain may be constructed, and in some small measure made effectual, without adopting a heating apparatus; but the agriculturist may rest assured that it will be most conducive to his interests, in constructing a drying-house, to adopt thereto a proper and well-arranged heating apparatus. With it, he will find that, in course of time, the extra outlay will be amply repaid, and his additional trouble fully compensated, by his independence of all external circumstances, such as dampness, calmness, &c., of the atmosphere.

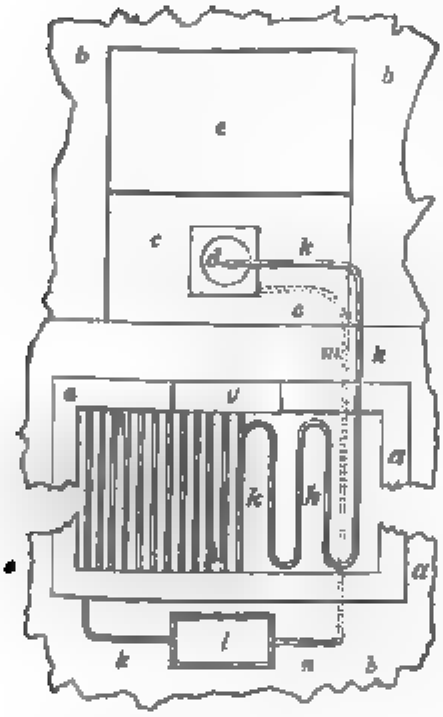
We conceive that the best mode of making the reader acquainted with the construction of drying-houses, in a simple yet efficient manner, will be to explain figs. 3 and 4, which contain a section and plan, with heating apparatus, the arrangements of which will of course differ in different localities. Fig. 3 is a longitudinal

Fig. 3.



vertical section of a drying-house; *a a* the walls; *b b* the ground in which the house is built; *c c* is a place excavated in the ground in front of the house; *e* the steps by which access is gained to the floor of *c c*; *d* the furnace and boiler of the heating apparatus; *f* the gangway up to the door *g*, stretching across the excavation; *h h* a false flooring, composed of small beams, having between each an interval or space of some two or two and a half inches, through which the heat ascends from the pipes *k k*, traversing the space between the floor of the building, and the beams constituting the false floor; *l* the feed cistern, as in fig. 2. Fig. 4 is a plan of the house, the same letters referring to it; *k k* is the ascending pipe, curved as seen, and should be supported and kept clear of the ground by non-conducting supports—say bricks; the curves

Fig. 4.



should not be larger than 2 inch radius if many pipes are required; the size of the curve will of course vary according to the size and convolutions of pipes. This ascending pipe should be continued to within 16 or 18 inches of the surface of the water in the cistern; *m n* the return pipe, which should be covered over with the non-conducting wrapper previously mentioned. The supply of air to the interior, without which no dependence can be placed on the operation of the drying-house, should be ample and easily under control. And particular attention should be paid to the due adjustment of the valves in the egress ventiducts placed at the top of the house. As a corresponding quantity of fresh air should be admitted, the valves at the fresh air ventiducts should be opened the same degree with those of the exit ventiducts; that is, when the exit ventiducts are opened one-half, the fresh air ventiduct valves should also be opened one-half. The fresh air ventiducts, in a case such as is represented in the diagrams, would be made at the bottom of the wall near the ground, and of that construction known as the "damper valve;" the wire or rope of the exit ventiduct valve should be attached to that of the fresh, and so adjusted, that when the fresh is opened one-half, the exit may be the same, and so on in the same proportion. The fresh air should be so admitted as to pass below the hot-water pipes; as a great velocity of air, through the materials to be dried, will only have the effect of drying the exterior, while the dampness will still remain in the interior. A slow rate of current, then, will be best; say that the whole body of the air in the room were removed twice in a minute, we think this rate of speed would answer. Should this velocity be too great, by shutting the valves it may be lessened; and *vice versa*. The calculation for ascertaining the area or surface of the hot-water pipe for any size of house is very simple. The temperature at which it is proposed to maintain the house must be settled on—we should say 100° would be high enough; and, as we mentioned, at the rate of current which would be beneficial, the quantity to be heated every minute will be twice the cubical contents of the house. Suppose the cubical contents to be 800 feet, according to our data, 1600 cubic feet will be required to be heated per minute. To this is to be added the loss of heat from ventilation, which will make the number of cubic feet to be heated per minute, in the above-mentioned case, 3200, or four times the

quantity contained in the room. The mean temperature of the pipes, when the altitude of the feed-cistern is 60 feet above the boiler, is 185°. In the generality of cases, the boiling point will rise one degree for every foot of height of difference between the cistern and boiler—suppose the mean temperature to be 140°, the rule for ascertaining the quantity of surface of pipe will be as follows:—"Multiply the cubic feet per minute of air to be heated to supply the ventilation and loss of heat, by the difference between the temperature the house is to be kept at, and that of the external air, in degrees of Fahrenheit; and divide the product by 2.1 times the difference between 140°, (the mean temperature of the pipes,) and the temperature of the house, (supposed, in our case, to be 90°,) this quotient will give the quantity of surface of cast-iron pipe that will be sufficient to maintain the required temperature." The above is deducted from Tredgold's rule. What is meant by the "difference between the temperature the room is to be kept at, and that of the external air," will be seen by the following recommendation. In calculating the sizes of pipes, the temperature of the external air that supplies the ventilation, differs, of course, from that of the heated air supplied to the interior. This forms an important feature in the calculation. The difference, then, between the two must be ascertained. The extreme case of cold experiencd during the day is 30°, and at night at zero. Tredgold is of opinion that the difference of the air in a stove or forcing house will never be more than 50°, and upon this founds the following rule:—"To the length of the stove in feet, multiplied by half the greatest vertical height in feet, add one and a half times the whole area of *glass*, and also eleven times the number of *doors;* the sum will be the number of cubic feet of air to be heated in a minute, from the temperature of the external air to that of the stove; which, being used as directed in our first rule, will give the quantity of surface of steam-pipe required." This rule will be found useful when windows are thought necessary in a drying-house, as through these a vast deal of heat is lost. Windows should generally be made double in such houses. Whenever a door is opened, a great quantity of heat escapes. But we would recommend every door of a drying-house to be made double; th[illegible] [illegible]pensive, will ultimately be found to be the most economica[illegible] [illegible]ll the provisions for heating, as in ventilation, it [illegible] excess than deficit. It will save in many [illegible] [illegible]nd expense. The disposition of the matter to be drie[illegible] [illegible] some importance; this, of course, will be best arranged accordin[illegible] [illegible]ality or arrangements of the house. In fig. 3, the smal[illegible] [illegible] represent sections of wooden beams stretched across [illegible] breadth [illegible] the house, and resting the ends on projecting [illegible]ckets. If these are placed 24 inches or so apart, room [illegible] will be given for the placing of the sheaves of grain, put[illegible] [illegible] beams [illegible] placing on them the sheaves to be dried.

The attendant will proceed till he gets to the last near the door. To insure a current of air through every part of the house, the area of tubes required for ventilation should be distributed pretty equally over the roof; thus, if the roof is twenty feet long, no less than three ventilators should be put up. To ascertain the area of tube or tubes for carrying off the vapour raised by the drying and the air, 1½ square feet of aperture must be allowed for every 270 feet of surface of steam-pipe. Thus, if there are 810 feet of pipe surface, the area of the ventilator tube will be 4½ square feet. The area for the admission of fresh air may be the same, if admitted by pipes; but to prevent a sudden influx of air, the area should be made nearly double that of the exit ventiducts.

We have now brought our remarks to a conclusion; we trust that the rules and recommendations given may be of use to the farmer and agriculturist. The plan here recommended may be useful for the drying of tiles, peat, &c., as well as grain; and we trust that the hope expressed by Mr Tredgold will be realised, namely, that "in many districts the use of artificial heat will increase, and the loss of much valuable grain be prevented." We will conclude by quoting from the same author. "Besides, with the knowledge that he can save his corn in good condition in a bad season, the farmer will have a mind more at ease: he becomes secure of that which, in the ordinary course, is very frequently seriously injured, and sometimes altogether lost. He may also turn the same contrivances to advantage in a wet hay harvest; and temporary erections will soon be changed for more permanent ones. The certainty of artificial heat will be to the farmer as important as the certainty of power is to the sailor; and these two classes of men, who have hitherto depended more than any other on seasons, will both receive great benefit by the application of heat. . . . It is not farmers alone that will be benefited by drying corn artificially in backward and wet seasons; for in such cases the whole population will feel the good effect of this plan. Unsound grain makes very indifferent bread, doctor it as you like; and the evil is too frequently a very general one."

Water. By J. TOWERS, Member of the Royal Agricultural Society of England, &c.—The following statements and observations have been originated by the investigation which commenced at the town of Croydon, in Surrey, on the 21st day of March, under the direction of W. Ranger, Esq., C. E. Superintending Inspector, and reported by him to the General Board of Health as a "Preliminary Inquiry into the Sewerage, Drainage, and *Supply of Water*, &c." I mention this report, chiefly, to confer on my subject something of an official character, but, of course, shall restrict my remarks to that portion of the report which is of general interest, inasmuch as it has brought to light many circumstances that

prove to what extent the waters in common use differ in quality, even in places not remote from each other, and thus may materially affect the comfort and health of the consumers.

With a view to appreciate the qualities of water, and the means by which they may be greatly affected, it will be proper, in the first place, to state that this fluid, which is universally diffused throughout nature, is not, as was believed, a pure and simple element, but a compound substance, proved by the most exact and conclusive chemical evidence to consist of two volumes of hydrogen gas, and one volume of oxygen gas—by measure—brought into a state of intimate union by the agency of electricity. Water produced artificially by passing electricity through those gases, mixed in the above proportions, may be esteemed the genuine type of simple water in its purest form. As an approach to it, water produced by the condensation of steam, and known by the name of distilled water, is used to a great extent in the laboratories of scientific chemists, but is very unfit for the use of the table, being flat and insipid, being void of atmospheric air in consequence of the great heat which is required by the process of distillation.

Rain water which has fallen in the open country, remote from the presence of smoke, and collected in clean slate or stoneware receptacles, is comparatively pure, but not by any means so much so as is generally imagined.

It has been justly stated that whatever foreign substances exist in the atmosphere of any locality, may be brought to the earth by rain; thus, in the air there are traces of muriates, of free muriatic acid, nitric acid, carbonic acid, and of carburetted hydrogen gases. According to Dr Daubeny's report, there may be "minute quantities of the metals, iron, nickle, and manganese, as well as of a peculiar substance called *pyropine*, chemically different from the extractive matter, and the gluten of plants and animals. Liebig insisted on the presence of ammonia in the air; and, in the second edition, p. 75, of his *Chemistry in its application to Agriculture*, considered it as the chief source of the nitrogen found in plants.

When I resided in that now open country, Maidenhead Thicket, (so called from the quantity of wood formerly found in that part of Berkshire,) I was able, by collecting and slowly evaporating rain-water, to which a very small quantity of muriatic acid had been added, to fix any volatile ammonia that might be present, and thus to obtain a minute portion of *muriate of ammonia*. By touching this muriate with caustic potass or soda, pungent ammoniacal vapour was always extricated, but tainted with that peculiar odor which rises from decomposing ordure. Liebig mentions these very circumstances, and insists upon the necessity of collecting the rain-water in places where smoke does not exist. The facts I have alluded to are incontrovertible; but still some doubt attaches to the experiment, for smoke yields muriate and sulphate of am-

monia, and will float in the atmosphere to great distances. But be this as it may, there are always decomposing animal matters on the surface of the ground, which yield gaseous ammonia to the atmosphere; and therefore, as it, in common with the ammoniacal muriates and sulphates, is very soluble in water, it becomes almost self-evident that snow and rain must contain varying portions of either one or other of them.

Rain-water, when very pure, is nearly equal to distilled water; it possesses great solvent powers, and is well fitted for the purposes of the experimental chemist. Every one is aware of its uses in domestic economy, wherein the peculiar softness (induced by the absence of mineral matter, and perhaps, to a small extent, by ammonia) enables it at once to combine with soap, and produce a perfect lather at a very light expense. Rain-water, if it fall upon slate or glass, and is made to pass through a filtering apparatus consisting of a six-inch layer of broken charcoal, interposed between two similar layers of clean coarse gravel, is fitted for the use of the table, and, from its solvent powers, it makes tea admirably, with a saving of that commodity. Rain-water, however, should neither be made to pass through leaden pipes, nor be retained in a vessel of the same metal. I shall, at the end of this article, allude to the construction of rain-water tanks, of which receptacles, observation and practical experience have proved the value in country districts, where rivulets and streams of good water are of rare occurrence.

Spring, and, indeed, *river* waters, vary much in purity, according to their sources, and the mineral strata through which they pass; and here we come at once to the subject of inquiry instituted by the Sanitary Commission.

The town and neighbourhood of Croydon is supplied with water partly by the Wandle, a small river, the sources of which rise near the town, and thus furnish a variety of streamlets that might be turned to the greatest advantage, were not its waters poisoned, or at least contaminated, by foul drainage to a very considerable extent. *Wells* also abound; but the inadequate supply furnished by them is very uncertain, and the general quality of their water inferior. It may not, therefore, be unreasonable to assume the condition of Croydon as a *type* of the water supply of many towns in the united kingdoms; because the geological character of this town and its immediate vicinity having been reported, and the quality of the waters submitted to analysis by authority, data are thereby furnished which will lead to comparative experiments, and thence to the induction of valuable facts.

The *hardness of water* is generally ascribed to the presence of chalk, held in solution by a double dose of carbonic acid; but independently of such a bi-carbonate of lime, and even in conjunction with it, we find a notable proportion of gypsum, which is lime

chemically united with the sulphuric acid. In the analysis of the Croydon waters obtained from wells, by Dr Playfair, noticed in page 24 of the Report, we read that the waters from five districts gave very dissimilar results. Thus:

1.	In Surrey Street the hardness was indicated by -	° 18
2.	In High Street, west, - - - - - -	22
3.	... east, - - - - - -	21
4.	In Park Hill, - - - - - - -	17½
5.	In North End, - - - - - - -	48

The degrees correspond with, and are equivalent each to, one grain of chalk in a gallon of water.

The water of the river Wandle, unpurified, was examined by Dr Thomas Clark, Professor of Chemistry in the University of Aberdeen. His report states the results to be—

Hardness, - - - - - - -	° 16·1
Alkalinity, - - - - - - -	15·65

Curd soap required to form a lather with 100 gallons, 34½ oz.

"Each degree of hardness indicates as much as would be produced by one grain of chalk per gallon;" while, "for every degree of alkalinity, a gallon of pure water will neutralise as much free acid (sulphuric, nitric, &c.) as one grain of chalk would neutralise." The experimental results will be made more intelligible as we proceed: in the mean time, I will mention a circumstance that occurred last year in two cisterns that are supplied by a well about 44 feet deep in the green sand, which, on the east side of Croydon, lies under a layer of still finer and whiter sand, below a very thick stratum of flinty gravel. I had long suspected the presence of *sulphate* of lime in the water beside the usual *bi-carbonate*, because it was not only very hard, but always responded to the test of baryta water. In August 1848 the ceilings under the cisterns became spotted, and, upon examination, it was seen that the lead bottoms were marked with numerous irregular whitish patches. The plumber was called in, and made it appear that the metal was corroded at *every spot*, so that water passed through by as many orifices. The inquiry and report of the General Board of Health, and the results reported, led me to a farther investigation of our well water; and on several recent occasions I have tried small quantities, and have always obtained from 3 or 4 measured ounces, tested with a solution of soda, nearly a grain of carbonate of lime (*chalk*) as a first precipitate; and then, by the addition of acetate or nitrate of baryta, a second precipitate of *sulphate* of baryta from the water already deprived of the before-mentioned chalk. I, therefore, ascribe the destruction of the lead cisterns to the sulphuric acid; and I find, upon inquiry, that a near neighbour is occasionally subject to a similar inconvenience.

The causes of hardness everywhere may be traced to the earthy salts which the water contains; these are, as has been stated, chalk

in solution, sulphate of lime or gypsum, and iron, occasionally. The waters of Croydon were analysed solely with the view to discover how much chalk they held in solution, and as the *evidence* of Professor Clark of Aberdeen, *taken before the Commission on the Health of Towns*, was much insisted on, it appears to me desirable to allude to the treatise written by that gentleman, because the method of purification suggested by him is exceedingly clever, and may be brought with facility to proof in a family where hardness of the water is found to be inconvenient. The following are the prominent facts of the evidence :—

In water, even of the purest quality, *chalk* is almost, or altogether, insoluble. Chalk consists of lime united with carbonic acid, in about the proportions of 9 parts of the former to 7 of the latter, by weight; and thus, if 16 ounces of pure dry chalk be burned in the lime-kiln till all the carbonic acid is expelled, only 9 ounces will remain out of the pound of 16 ounces. These 9 ounces, presuming that the lime is pure, and free from any adulteration, will be soluble in about 750 times their weight of distilled water. *Chalk*, so burned or de-carbonated, is called quick-lime or *shell-lime*, and water holding its full equivalent of such lime in solution is *lime-water;* if fresh made, it is perfectly clear and colourless, but if for any time it be exposed to the air, it will gradually be covered by a thin pellicle, which will fall to the bottom of the fluid in flakes; these are a sort of crystallised chalk, that will hiss (*effervesce*) with acid, proving that the lime has absorbed carbonic acid from the air, and, consequently, that the atmosphere must contain it.

The 7 parts of 16 lost by the burning of chalk in the kiln consist of carbonic acid; and that this is soluble in water can be rendered apparent by putting powdered chalk, or rather sugary white marble dust, into a chemical bottle with two necks, to one of which is fitted a bent glass tube, the other end of the tube passing into a second bottle that contains a quantity of rain-water ; the flatter or more mawkish this shall be the better, as the effect produced will then be the more apparent. The apparatus being thus arranged, pour water on the powder in the first bottle sufficient to cover it to the depth of an inch or more, stir with a piece of wood, pour in a little muriatic acid, and immediately close the orifice with the ball of the thumb or a close-fitting cork. Hissing will take place, owing to the extrication of carbonic acid gas, and this will pass through the bent tube into the water, forming rapid bubbles. The greater part of the gas thus escapes, but some portion will be taken up by the water, and sufficient to confer on it a brisk and peculiar acid taste. Water so acidified can dissolve a minute quantity of chalk ; and, according to Dr Clark, " a pound of chalk dissolved in 560 gallons of water, by 7 ounces of carbonic acid, would form a solution not sensibly different, in ordinary use, from the filtered water of the Thames, in the average state of that river. Chalk, which chemists call carbonate of lime, becomes what they call bi-carbonate of lime when it is dissolved in water by carbonic acid."

Before I proceed further, I beg to call attention to the well-known circumstance, that *hard water*, which curdles soap, always deposits a quantity of scaly matter on the kettles, &c., in which it is boiled. Heat expels the extra portion of carbonic acids which hold the chalk in solution, and thus liberates the chalk, which then fixes itself, with other impurities, (frequently iron,) upon the metal.

Any lime-water may be mixed with another, and any solution of bi-carbonate of lime with another, without any change being produced, the clearness remaining undisturbed. Not so, however, if *lime-water* be mixed with a solution of bi-carbonate of lime; very soon haziness appears, deepens into a whiteness, and the mixture soon acquires the appearance of a well-mixed whitewash. When the white matter ceases to be produced, it subsides, and in process of time leaves the water above perfectly clear: the subsided matter is nothing but chalk.

Dr Clark endeavours to elucidate his theory by the following rationale:—

What occurs in the operation will be understood if we suppose that one pound of chalk, after being burned to 9 ounces of quick-lime, is dissolved so as to form 40 gallons of lime-water; that another pound is dissolved by 7 ounces of extra carbonic acid, so as to form 560 gallons of a solution of bi-carbonate of lime; and that the two solutions are mixed, making up together 600 gallons. The 9 ounces of quick-lime from the pound of burnt chalk unites with the 7 extra ounces of carbonic acid that hold the dissolved pound of chalk in solution. These 9 ounces of caustic lime, and 7 ounces of carbonic acid, form 16 ounces, that is, one pound of chalk, which, being insoluble in water, becomes visible immediately on its being formed, at the same time that the other pound of chalk, being deprived of the extra 7 ounces of carbonic acid that kept it in solution reappears. Both pounds of chalk will be found at the bottom after subsidence. The 600 gallons of water will remain clear and colourless, without holding in solution any sensible quantity either of quick-lime or of bi-carbonate of lime.

The process of Dr Clark is patent, and cannot be imitated for a public purpose; but in private families, if pure hot or caustic lime is at command, the operation can be performed with great facility. In preparing the lime-water, an excess of lime is admissible, to allow for the ordinary defects in the burning; and one gallon, if kept in a well-stopped glass bottle, will purify much hard water, to which it may be added in small quantities as required. Experience will soon instruct, and also prove that the advantages claimed by Dr Clark are fully established by fact. These are—

1st. The water will be much softened, and to such a degree that in lieu of from 24 to 32 ounces of the best *curd*-soap being required to form a complete lather with 100 gallons of the water supplied by the London Companies, *a similar lather may be produced by about one-third of the soap*, with 100 gallons of the same water purified by the lime process.

2d. The *new process* will *prevent fur in boiling*, for the reason already given.

3d. It will separate *vegetating* and *colouring* matter.

4th. It will destroy water insects; and

5th. It is remarkable as a chemical process *for merely withdrawing* matter from solution in water, *imparting none*.

Enough, I hope, has been stated, and extracted from good authorities, to prove that the remedy for hard water is important, and very easy of application; as, however, rain-water, when clean, is exceedingly useful in domestic economy, I conclude this article by quoting a few paragraphs from a paper written by me on rain-water tanks in Berkshire, partly on the principle of one I found at St Peters, Isle of Thanet. The rain-water tanks there are sometimes square, but generally they are constructed of a cylindrical form, somewhat like a shallow well; they are sunk in the ground, and the walls should be constructed with the best bricks, laid 9 inches in thickness. The brickwork will be more secure if it be put together with the best Parker's cement; but good mortar made up with finely sifted sea-coal ashes and the very [illegible] lime, [illegible] particularly the [illegible] thoroughly burned limestone,)

will do extremely well. The internal surface must, however, be entirely and accurately covered with a coating of the cement, at least half or three quarters of an inch thick. From 1000 to 5000 gallons of rain-water may thus be collected, and secured from dust and dirt. But in order to purify the water from soot and particles of matter which pass from the roofs, a filter with strata of gravel and charcoal, as before alluded to, should be interposed. A large barrel placed near the tank, and so prepared, would answer every purpose. The water would enter it at the top, which should be covered with a strainer of coarse canvass or wire gauze; pass through the purifying strata, and be conducted by a discharge pipe into the tank.

The tank is entirely built in the ground, below the surface level. In Thanet it was covered with flat paving-stones, through one of which a narrow opening was cut, large enough to admit a plumb and line, to sound the depth of water. In Berkshire the walls were gathered in, to meet the framing of an 18 inch flap door, that served as a man-hole. A few pounds covered the expense of a medium-size tank, and we believe that a sum of £10 in the whole would also furnish it with a pump and pipe, by which to introduce this salubrious water into the dwelling, to be applied to every purpose to which *soft* water in particular is so indispensably requisite. To render, however, the economy complete, (I say this practically,) the housekeeper should purchase his bricks and cement, and employ a handy person to lay the bricks, stones, frame, &c., at fair daily wages. Such persons are to be found in most country places.

On Useful Insects and their Products. By JAMES H. FENNELL, Author of *A Natural History of Quadrupeds*, &c.—It has been said that Henry II. of France wore, at the marriage of the Duchess of Savoy, the first silk stockings that were made in France; but De Serres tells us that, owing to the dearness of silk, but "especially from modesty," that king "would never weare silk stockings, although that in his time the use of them was then received in France."* The wearing of silk in England began in the thirteenth century; but for more than four hundred years it was used almost exclusively by the upper classes, and it is only in recent times that it has formed part of the dress of the middle and lower classes. It is recorded that silk mantles were worn by some noblemen's ladies at a ball in Kenilworth Castle, Warwickshire, in 1286, being the fifteenth year of the reign of Edward I.† Silken articles are said

* *The Perfect Use of Silk-worms, with the Planting of Mulberry-trees.* By D'OLIVIER DE SERRES; done into English by Nicholas Geffe, with a Discourse of his own on the Means and Sufficiencie of England for to have abundance of Fine Silk by feeding Silk-wormes with the same. London, 1607, p. 2.

† *Tablet of Memory*, 1838, p. 178.

to have been first *manufactured* in England in 1504, being the twentieth year of Henry VII.'s reign. Howell says, "that great and expensive prince, Henry the Eighth, wore ordinarily cloth hose, except when there came from Spain, by great chance, a pair of silk stockings." It was in 1534, or the twenty-sixth year of his reign, that the English clergy first wore silk. King Edward VI., his son, Howell relates, "was presented with a pair of long Spanish silk stockings by Sir Thomas Gresham, his merchant, and the present was much taken notice of." Both Stow and Howell inform us that in the third year (1560) of Elizabeth's reign, one Mistress Montague having presented the queen with a pair of knit black silk stockings, she was so delighted with them that she never would wear cloth hose after them. Mary Queen of Scots possessed ten pair of woven hose of silk. The value of such articles at that time may be conceived from a letter which James the Sixth wrote to the Earl of Mar, telling him that the Spanish ambassador was to be presented at court, and begging the loan of his lordship's silk stockings for the occasion, accompanying the request with this touching appeal to his loyalty and good nature, "Ye would na sure that your king should appear as a scrub before strangers." These articles seem soon to have become less rare, for it appears from an inventory of Sir Thomas Boynton of Barmston, taken February 28, 1581 (the twenty-fourth year of Elizabeth, that this worthy knight possessed no less than "eleven pair of silk stockings," which altogether were valued at fifteen pounds.* In 1582 the Lord Mayor and Common Council of London enacted that no apprentice should wear "silk in any part of his apparel." By the Act of Parliament (9 James I., 119), it is ordered that "no man shall wear clothes of silk, or use furs, except knights and lords of two hundred marks at least of yearly rent, and their eldest sons and heirs, without special leave of the king." There is extant an autograph letter of King James, written from Stirling Castle, June 26, 1594, "to our trusty and well-beloved counsellor, the Master of Gray," desiring that three silk beds may be sent, as promised, to Edinburgh, by the 1st of July. They were lent for the occasion of the baptism of Prince Henry. Mrs Damer, the celebrated sculptor, is said to have been the first female who wore black silk stockings in England; for ladies wore white stockings even in mourning as late as the year 1778.

[illegible]ilk covering, of the texture of a common handkerchief, placed [illegible] the mouth is stated to possess the peculiar property of re[illegible] [illegible] influence and of neutralising the effects of mala[illegible] [illegible] that the heated air proceeding from the [illegible] [illegible]here within the veil of silk, of power [illegible] [illegible] the miasma in its passage to the mouth,

* [illegible] of [illegible]rness, 1841.

although it may be equally true that the texture of the silk covering may act mechanically as a non-conductor, and prove an impediment to the transmission of the deleterious substance. Silk is less perishable than most textile fabrics. Some years ago, upon opening a grave in the churchyard of Falkirk, Stirlingshire, a silk ribbon was found entire and perfectly uninjured, although it had lain for more than eight years in the earth, and in contact with a corpse which had passed through every stage of putrefaction ere it was reduced to its kindred dust.

Notwithstanding its beauty, strength, and durability, the Mahomedan doctors have decided that, as silk is the produce of a worm-like creature, it is unclean, and that, therefore, a person wearing a garment composed entirely of silk, cannot lawfully offer up the daily prayers enjoined by the Koran.

Some of the Chinese silkworms spin white silk, but Mr W. Sells, who has carefully watched and noted their progress through the various transformations, seems to regard them as only a variety of the common species, and not as a distinct one. Having obtained in 1836 some of the eggs which produce this variety, he found they hatched in the beginning of June, and the caterpillars, being regularly fed on mulberry leaves, throve very well, and arrived at maturity and began spinning towards the end of July. They slightly differed from the common silkworm by a blackish spot on each side of the head; and the moths, which began to appear at the close of August, were perhaps rather larger, and the dark lines on the wings were of a little deeper colour. From the hatching of the egg to the death of the moth, this variety's existence averaged 100 days. The silk was not so abundant as on the cocoon of the common sort; of not quite so strong a texture; less easily wound off; but as the silk is beautifully soft and perfectly white, further careful observation may show that it is better adapted to some purposes in manufacture than the pale yellow and orange sorts of silk.*

The caterpillars of the Atlas moth (*Attacus Atlas*, Germar), a native of Surinam and other parts of America, and also of China and other parts of Asia, feed on the leaves of the *Citrus*, and spin silken cocoons of great size, which sometimes unwind in threads of many ells in length, more firm and tenacious than common silk, but the cases are very difficult to unravel, and are commonly carded. Madame Merian observes, however, that they would be valuable to mankind if they could be kept in confinement.† In the East Indies silk is obtained also from the cocoons of two other species, namely, *Attacus mylitta* and *A. cynthia*.‡ In

* *Entomological Society's Transactions*, 1837, vol. ii. p. 40.

† The Atlas moth is a fine large species, measuring 9 inches across the wings, which are adorned with a transparent spot in the centre.

‡ See *Linnæan Transactions*, vol. vii., and Colonel Sykes's Account of the Kolisura Silkworm of the Deccan, in the *Asiatic Society's Transactions*, 1834, vol. iii.

India three other native species are also used; for instance, the Tusseh silkworm, which feeds in the jungle on the jujube tree; the Arrindy, which feeds on the *Palma Christi;* and the Moongha, whose produce is used there to an extent of which we have but little idea.

In South America there are several caterpillars, besides those of the common silk-moth and Atlas-moth, which yield excellent silk. Spix says that in Brazil a species of silk-worm is abundant on a laurel-like shrub, particularly in Maranhâo and Para. He says, that although its thread promises a much more brilliant silk than that of Europe, it has never yet been employed, although it might be with very great facility.* At Maragnan and Rio Janeiro the caterpillars of several species of *Bombyx* spin their cocoons of a thicker and stronger silk than that of the common silk-worm; and Padre Mestre, who gave the former a trial, found that it forms a very solid material. It has been proposed to cultivate for the feeding of them a species of mulberry with small and inedible fruit, growing near Rio Janeiro.

A caterpillar, which the Indians call sustillo, of the tribe and size of the silk-worm, feeds on the leaves of the pacal, a common tree in Peru, and fabricates a kind of silk paper very similar to that made in China. When the caterpillars are about to transform, they assemble at the body of the tree, and co-operate in forming, with the greatest symmetry and regularity, a web of admirable texture, consistency, and lustre, and which is larger or smaller according to their numbers. Beneath this web they all unite; and, disposing themselves in vertical and even files, form in the centre a perfect square. This done, each of them spins its cocoon of a coarse and short silk, in which it changes to a chrysalis. By-and-by the chrysalis becomes a moth, which, impatient of further confinement, and anxious to take wing, breaks its way through the general web, fragments of which consequently remain suspended to the trunk of the tree, waving to and fro like streamers, and become more or less white, according to the situation and atmosphere. This natural silk paper has been gathered measuring a yard and a half, of an elliptical shape, which is peculiar to all of it.

The caterpillars of the common ermine moth (*Yponomeuta padella*) are gregarious, and naturally construct a very fine close web, impenetrable by air, but easily detached from the trees. M. Habenstreet of [illegible]nich induced them to spin it on a suspended paper model [illegible] which he gave the form and size he required; [illegible] square shawls of an ell width, others two [illegible]de, a balloon four feet in height and two in [illegible] and all of a much lighter fabric than the finest [illegible] weighed less than five grains, and the flame

* Spix's *B[illegible]* (1823-31.)

of a single match held under it for a few seconds would raise it to a good height, whence it would not descend for half an hour; a shawl of the size of a square ell, when stretched and blown into the air, resembled a very light smoke passing over; a whole lady's dress, with sleeves, but without a seam, he presented to the Queen of Bavaria, who mounted this fairy-like attire on another dress, and so wore it on many great occasions; a shawl of a square ell in size cost only eight francs. The caterpillars, two of which are able to produce a square inch of this delicate fabric, glue their threads close together while spinning, and, to increase the thickness of the layer if necessary, they were made to pass repeatedly over it; many were of course employed, and those parts of the model and pattern not to be covered were rubbed with spirits of wine, which prevented the caterpillars from working over them. A web seven feet square, perfectly pure, and as brilliant as taffety, was the result of three weeks' labour of about five hundred caterpillars.* These caterpillars are very abundant in our own country, and their webs may be seen every summer in our hedges and gardens. No doubt the same thing might be effected with various other British caterpillars, if persons possessing leisure and ingenuity would make the interesting experiment.

Latreille and other naturalists have recommended a trial of manufacturing articles from the silk of the caterpillar of the crimson under-wing-moth, (*Catocala sponsa;*) and Wilhelm says that the experiment has been successfully tried in Germany with the silk of the emperor-moth, (*Saturnia pavonia minor*), by M. Wentzel Hegeer de Berchtoldsdorf, under an imperial patent.† Both these species may be found in our country: the former in Kent, Surrey, Berkshire, and Hampshire, feeding on the oak; the latter in Kent, Surrey, Yorkshire, Lincolnshire, Norfolk, and Shropshire, feeding on blackthorn, alder, oak, bramble, rose, elder, &c. Britain produces more than two thousand species of moths and butterflies, yet none of their caterpillars do we turn to any useful account. This is only one instance, out of many that might be mentioned, of our slowness, prejudice, or indifference about availing ourselves of the benefits we might derive from many of our natural productions at present neglected.

Over the surface of the large heaps of maize which are laid up in store in Mexico, the caterpillars of a small moth spin a large delicate silken web, 4 or 5 yards long, known there by the name of the Tela de Maize, or maize cloth. The inhabitants use it as a styptic, or dressing for recent wounds, as the spider's web is used in many parts of Europe.

It was formerly conceived that "nine caterpillars of the moth of

---

* *Le Journal de la Société d'Emulation, &c.*
† Wilhelm's *Recreations in Natural History.*

the wild teazel, enclosed in a reed or goose-quill, were a remedy for the ague." Kirby and Spence suggest that the tenacious prickly spines or hairs of the caterpillars of the tiger-moth, (*Arctia Caja*), and of other lepidopterous insects, might be used as an anthelminthic, or destroyer of intestinal worms.

Ray was the first to suppose that Pliny's *Cossus* (which was fattened for the table by the Romans) was the grub of some beetle; but subsequently having observed that the large caterpillar of the goat-moth has the power of retracting its prolegs within the body, so as to more nearly resemble a *worm*, he conjectured that the hexapod grub from Jamaica, (possibly in reality that of the well-known beetle, *Prionus damicornus*,) given to him by Sir Hans Sloane, might possess the same power, and, accordingly, be the caterpillar of some species of moth.* Linnæus, seemingly taking a hint from Ray's opinion, supposed the goat-moth's caterpillar to be the ancient *Cossus*—hence the goat moth has acquired the name of *Cossus ligniperda.* There is, however, a strong reason against its being Pliny's insect, for the goat-moth caterpillar is a disagreeable, fetid creature, not very likely to tempt a Roman epicure, and it lives generally in the willow, whereas Pliny's resides in the oak. In short, the Roman *Cossus* was probably a beetle. Nevertheless, there are modern instances of the caterpillars of moths being eaten. Reaumur, speaking of the voracious caterpillars of the gamma-moth, (*Plusia gamma*,) which committed serious ravages in France in 1735, suggests the eating of them as one good mode of diminishing their vast numbers. This is the retributive system which the Irish peasantry adopted against the legion of cockchafers that troubled them in 1688. Amongst the delicacies of the Boshiesman's diet, Sparrman includes the caterpillars of butterflies. The Chinese, who wisely try to convert everything to some useful account, eat the caterpillars of a hawk-moth, (*Sphinx* ——,†) some of which tribe are, in Dr Darwin's opinion, very delicious; and they also eat the chrysalides of the silk-moth, after they have wound the silk off the cocoons. The Australian savages constantly eat caterpillars, for which they have a great partiality. The New Hollanders eat the night-feeding caterpillars of a singular species of moth, (*Nycterobius.*) Bennett tells us, that on and in the crevices of the Bugong mountains, but only about the insulated and peculiar masses of granite, congregate vast multitudes of small moths, called *bugong* by the aborigines, who, to procure them with great [illegible] make smothering fires underneath the rocks on which [illegible] insects have settled, and thus suffocate them with smoke, [illegible] frequently in bushels-full at a time. [illegible] place upon the ground, of a size pro-

* [illegible] (Ninth Edition), p. 307.
† [illegible] Staunton's Voyage, vol. iii., p. 246.

portioned to the number of insects obtained. On this space they burn a fire until the ground is tolerably hot. The fire is then extinguished and the ashes removed, and the moths are placed upon the heated circle, and stirred about until they lose their down and wings; and, more effectually to separate these from the bodies, the broiled insects are placed on pieces of bark, and winnowed. The bodies are now eaten, or else placed in a wooden vessel, called a *walbun*, or *culibun*, and pounded by a piece of wood into masses or cakes resembling lumps of fat, or dough made of smutty wheat mixed with fat. The body of the moth is large in proportion to the size of the whole insect, and contains a yellowish oil, resembling in taste a sweet nut. The baked masses or cakes (with which the "Netbuls" or "Zalabats" of the native tribes are loaded during the season of feasting upon the bugong moths) will not keep above a week, and seldom even so long, but by smoking they are able to preserve them even for that time. The first time this diet is eaten by the native tribes, it produces violent vomiting and other debilitating effects, but after a few days the people become accustomed to it, and thrive and fatten exceedingly upon it. So greatly do they esteem this insect-food, that they assemble from all parts of the country to collect the moths on the mountains, the height of which, from the base, may be two thousand feet, and more than three thousand feet above the level of the sea. The quantity of moths which may be collected from one of the granite groups, would amount, it is calculated, to at least five or six bushels. The largest specimen of the moth obtained by the traveller measured seven-eighths of an inch with the wings closed, the length of its body being five-eighths of an inch, with a proportionate circumference; the expanded wings measured one inch and three-quarters across; their colour was dark-brown, with two black ocellated spots upon the upper pair; the body was full of yellow oil, and covered with down.*

VI. DIPTERA.—About the lakes of Mexico there abounds a species of two-winged fly, which the natives call *axaycat'l*, and the eggs of which being deposited in immense quantities upon the rushes and corn-flags, form large masses, which are taken up by the fishermen to sell in the market; this sort of caviare, called *ahuauhtli*, is baked in cakes, and has much the same taste as the caviare of fish. It was a favourite food of the Indians long before the conquest. Father Gage, in his *Travels*, says, that "at one season of the year, the Indians had nets of mail, with the which they raked off a certain *dust* that is bred on the water of the lake of Mexico, and is kneaded together like unto *oas* of the sea. They gathered much of this and kept it in heaps, and made thereof cakes like unto brick-bats. And they did not only sell this ware

* Bennett's *Wanderings*.

in the market, but also sent it abroad to other fairs and markets afar off; and they did eat this meal with as good a stomach as we eat cheese." It is not despised even at fashionable tables in the capital, and is now a common dish among the Spaniards as well as the Mexicans, who eat not only the eggs but the flies themselves, mixed up in a mass and prepared with saltpetre.

Many an Englishman is fond of eating *hoppers*, which are the maggots of the cheese-fly, (*Piophila casei.*)

VII. HEMIPTERA.—The ancients used to encage the insects of the tree-hopper tribe, (*Tettigonia*, *Tettix*, or *Cicada*,) for the sake of their chirping; and the Athenians were so enamoured of them that they used to decorate their hair with golden images of them. From the days of Homer, who compares old men's garrulity to the chirping of these insects, they have enjoyed poetical celebrity; and Anacreon has inscribed a celebrated laudatory ode to them. Aristotle says that they were eaten by the most polished Greeks, who accounted them delicious, and that the grubs (*worms* he calls them) live and grow in the earth; that they transform from grubs to *tettigometra*, (meaning thereby pupæ or chrysalides;) that they are most delicious just before they emerge into the perfect state; and that of the perfect specimens, the males at first have the best flavour, but the pregnant females are preferable. Athenæus and Aristophanes mention their being eaten; and Ælian expresses indignation at the fact that these insects, sacred to the Muses, were strung, sold, and eagerly devoured in his own time. Pliny says that the Eastern nations, even the wealthy Parthians, used to eat them. In modern times, the aborigines of America pluck off the wings of *Tettigonia septemdecim*, and then boil the insects for food.*

In some parts of Persia, the manna collected from various trees is believed to be an insect secretion upon them. The *Coccus manniparus* produces manna on Mount Tabor and in Arabia. A minute species of *Psylla* forms the womela, an analogous secretion, on the leaves of the Eucalypti in New Holland. This constitutes a great portion of the food of the natives in New South Wales. Burckhardt observes, that at Erzeroum a substance of the taste and consistence of manna distils from the gall-bearing trees, and which is a principal food of the inhabitants. This substance probably arises from the insects that have caused the galls. Botanists suppose that the medicinal manna of our shops, procured from Sicily and Calabria, is a gum that exudes from the flowering ash, (*Fraxinus Ornus*;) but entomologists suspect that it is the production of plant lice, (*Aphides*,) infesting that tree; and it is the opinion of [illegible] honey-dew, which somewhat resembles fresh manna, is nothing [illegible] droppings of insects of this kind.

* [illegible] Transactions, (1763,) n. x.

The lantern or fire-fly (*Fulgora lanternaria*) belongs to the present order, though the fire-fly of many careless writers is in reality the luminous *beetle* which I have already noticed. In some places *lantern-flies* are used instead of candles. Madame Merian relates the fright she experienced when she opened a box containing some lantern-flies, and beheld it full of fire. Mr L. Guilding says, that a glass filled with healthy specimens presents a splendid appearance.

The larvæ of *Cicada limbata*, found in various parts of the Chinese empire, produces a kind of white wax. Gordon, in his *History of China*, improperly calls these insects little *worms*. They inhabit most of the south-east provinces of China as well as Cochin-China, but the best exist in the provinces of Se-tchuen and Yuman, and from the territories of Hen-tcheou and Yung-tcheou. The wax-insect does not much exceed in size the common fly; every part of it appears to be perfectly white, or at least to be completely covered with a white powder; and the head is furnished with pectinated antennæ arched forwards. In its mature state, the wax-insect is furnished with wings. The stems of the privet-like shrub on which these insects swarm, appear entirely whitened by a substance or powder strewed upon them; the same in nature, apparently, as that with which the body of the insect is covered. At a later period of their larva state, the insects attain a blackish chestnut colour, and form on the tree little pelotons, each about the size of a grain of millet. These are attached to the branches, somewhat in the manner of bunches of grapes, the tree appearing, at first sight, as though bearing fruit. The natives gather these pelotons about the month of April or May, and, having wrapped them up in the broad leaves of the Yo, (a kind of grass,) suspend them from the trees. Towards the beginning of the spring they increase in size; and on the coming of the warm midsummer weather, they open, the insects emerge from them, crawl about on the leaves and stalks, and deposit their valuable wax, called by the Chinese *Tchang pe la*. It is at first somewhat similar to a white grease; but it speedily hardens, and then assumes more the character of wax. When in a fit state, it is scraped from the branches, generally in the autumnal months, and collected in a vessel. By pouring the melted wax into cold water, it coagulates into a paste, which is easily formed into cakes. Sir G. Staunton says it will also coagulate when mixed with oil and other oleaginous substances, so as to be fit for making candles. When composed of one part wax, dissolved in three parts of olive-oil, it is nearly as firm as bees'-wax, and is much superior to it. The candles made of this wax yield a clear light without smoke; but owing to their being rather costly, they are used chiefly by the highest classes in China. Chi-Tchin, a Chinese writer, states that, in the dynasty of Yuen, when the properties of this wax began to be known in China, persons of

all ranks commenced using it, both in medicine and domestic economy. The medicinal virtues of the wax are highly commended by Tchi-hen and other Chinese physicians; but their enumeration of its curative properties too much resemble the style of Culpeper and old Gerard to seem worthy of implicit belief. It is thought to have a wonderful tendency to assist the replacement of dislocated bones, to unite dissevered nerves, to heal wounds, to stop bleeding, and appease pain.

Research on the influence which certain Alimentary Substances can exercise on the proportion of Fatty Matters contained in the Blood. By M. Boussingault.—Some observers have stated that, under certain circumstances, the serum of the blood assumes a milky aspect, caused by the globules of fat held in suspension, and that they have met with such milky blood containing as much as 12 per cent of fatty matter. Others have gone still further, and asserted that this proportion of fatty matter in the blood can be increased to an almost indefinite extent by feeding the animal with fat, and that the same phenomenon is exhibited when the animal is fed for a sufficient length of time in such a way as to encourage it to fatten.

I have long wished to prove the truth or falsehood of these positions; but as, in my experiments on digestion, I only had occasion to ascertain the quantity of fatty matter absorbed by the intestinal canal, the subject was left in such a state of doubt as will, I trust, be removed by the present series of experiments. The question to be decided is,—Whether during the digestion of a substance containing much fat, there was any more fat in the blood than when the animal was fed on a substance containing no fat.

Sandras and Bouchardat have established, in their work *On Digestion*, that the nature of the food did not exercise any material effect on the quantity of fatty matter in the blood. Thus, whether the food consisted of suet, hogs'-lard, or of bread and broth, (from which the fat had been skimmed,) the blood of dogs always contained from two to three thousandth parts of fat. The presence of this small quantity in the blood of those animals which had been fed upon bread and broth was explained by the supposition (whether correct or not) that these substances always contain a proportion of fat.

These results are confirmed by my researches, in so far that the blood of birds on which my experiments were tried always contained only about four to five thousandth parts of fat. Like the physiologists above quoted, I have proved that the blood of animals fed upon a substance containing little or no fat always contained the same proportion of fatty matter as those animals which have been fed upon fat. But I cannot with them attribute the origin of the fat found in the former case to the small quantity of oily

matter found in the food, because I found the same results when the animals were fed upon the white of eggs or starch, substances which are, as nearly as possible, destitute of fat. And, more than that, I expect that I have ascertained that the fat found in the blood has not for its immediate origin the fat found in the food, because I found that the blood of animals deprived of nourishment for some days contains as much fat as the animal which had fed upon lard or walnuts.

The experiments were conducted as follows:—

The animals in each lot were first deprived of food for 36 hours. One was then killed fasting, the others were fed with different kinds of food for a definite time.

The blood was received into a weighed capsule, dried in a stove, pounded and dried again. The blood was considered dry when it did not vary more than a few milligrammes in an hour. I mention this circumstance, because I never could get it so dry as not to continue to lose weight by continued drying. I have, for instance, continued to dry the blood for several days, and it always continued to lose weight—probably because it, during that period and at the temperature employed, experienced a slow combustion.

The dry blood was digested with ether, and the fat obtained well washed with water, leaving a yellow substance with a characteristic and disagreeable odour. The fat of the blood appears to be identical with that extracted from chyme. The following table gives the results of the experiments:—

	Quantity of blood experimented upon.	Dry blood obtained.	Per cent of dry blood.	Fat obtained.	Proportion of fat to the blood in its natural state.	FOOD.
	Grains.	Grains.		Grains.		
FIRST SERIES. Pigeons, 3 weeks old.	17.30	2.86	16	[redacted]	.0021	Starch.
	17.34	3.27	19	.097	.0056	White of egg.
	14.95	2.86	19	.065	.0043	Nothing.
SECOND SERIES. Pigeons, 4 weeks old.	14.315	2.58	18	.071	.0046	Starch.
	15.4	2.99	19	.085	.0055	White of egg.
	14 435	2.83	19	.094	.0065	Lard
	13.94	3.03	21	.044	.0036	Nothing.
	13.325	2.52	19	.094	.0070	Nothing.
THIRD SERIES. Ducks.	48.71	7.50	15	.204	.0042	Starch.
	34 26	6.27	18	.152	.0044	White of egg.
	37.55	8.10	21	.277	.0049	Nuts.
	33.57	6.02	17	.114	.0034	Nothing.

Geographical distribution of the Cultivated Plants, which are used by Man for Food.—The culture of the cereals in Sweden and Norway extends as far north as the 70th degree; that is, a little beyond the limit of trees. This is, however, the only country in which they pass the arctic circle, by which they are everywhere else bounded. In the west of Siberia the cereals reach 60° north latitude; towards the east, only 55°; but on the east coast they do not grow in Kamstchatka, or to the 51°. In America they are cultivated as far north as 57° in the Russian settlements, but on the east coast, they do not pass the 50°, or at most the 52°.

Barley is the only grain which ripens at these limits; next to it comes the *oat*, but the latter crop is not so safe. The latter grain is used by man for food in the north of Scotland, Norway, Sweden, and Siberia. Further south *rye* begins to be more generally cultivated, though it reaches as far north as the oat in Sweden and Norway. Rye is the principal grain grown in the northern part of the temperate zone in Middle Europe; that is, in the south of Sweden, in Denmark, on the shores of the Baltic, in northern Germany, and in a portion of Siberia.

Next commences *wheat*, and the oat is then less used by man, (except for his cattle,) and barley is made into malt. We have then a wide zone in which wheat is grown to the exclusion of rye, as in the south of Scotland, England, the centre of France, part of Germany, Hungary, Crimea, and the Caucasus; also those parts of Central Asia where agriculture exists. As the vine grows in part of this zone, wine takes the place of beer, and consequently barley is less cultivated.

Wheat extends south until it is grown alongside of maize and rice. This is the case in the Spanish peninsula, part of the middle of France—especially where it joins the Mediterranean—in Italy, Greece, Asia Minor, Syria, Persia, the north of India, Arabia, Egypt, Nubia, Barbary, and the Canaries. In the latter countries, maize and rice are the usual crops towards the south, with sometimes the *Sorgho* and the *Poa Abyssinica.* Rye, throughout these two zones of wheat, is still cultivated at considerable elevations; also the oat; but this latter grain finally disappears as we go south, on account of the preference given to barley for feeding horses and mules. On the eastern coast of Asia, in China and Japan, on account of the deeply rooted customs of the country, our cereals are almost all abandoned for rice, which is also the principal grain grown in the southern provinces of the United States. Maize is much more general in the remainder of this part of America than it is in the old continent.

In the torrid zone, *maize* is almost exclusively grown in America, and *rice* in Asia: most probably these are the original *habitats* of these two grains. Both are equally cultivated in Africa.

In the southern hemisphere, even when the temperature admits

the growth of the cereals, they are yet much more rare than in the northern, from the want of civilisation, and also from the thinness of the population. In this part of the globe, apart from these influences, the colonists who settle in these countries have great influence over the grain which is grown. Wheat predominates from the middle of Brazil to Buenos Ayres, in Chili, the Cape of Good Hope, and in New Holland. In the southern part of New South Wales, and in Van Diemen's Land, rye again begins to show itself.

In examining the variation made in these zones by variation in altitude above the sea, we perceive analogous changes to those produced by latitude. For instance, on the Andes in equatorial America, maize predominates between 3000 and 6000 feet above the sea, and occasionally reaches 1200 feet higher. Between 6000 and 9000 feet, we find the cereals of Europe, rye and barley highest, and wheat lowest.

The *potato*, within a comparatively modern date, has spread into every corner of the globe wherever agriculture exists, and has added very materially to the amount of food produced. In some (unfortunate) countries the potato has completely replaced the latter. The potato extends to the utmost limit of the growth of the cereals, and may ever pass it when early varieties are cultivated. In this way the potato is grown in Iceland, and at considerable heights on the mountains of Europe, where the cereals are never sown. In warm countries the potato degenerates rapidly, and is consequently abandoned, except at sufficient heights to secure the necessary climate. Its culture is general, according to Humboldt, on the equatorial Andes between the height of 9000 and 12,000 feet.

In Upper Peru, the *quinoa*, a species of the genus *chenopodium*, was commonly cultivated before the arrival of the Europeans for its starchy grains. The representative of this plant in England is *fat-hen*, *spinach*, and suchlike. The quinoa is now little grown.

Some species of *buckwheat* are much cultivated by the tribes inhabiting the central plains of Asia, whence undoubtedly these plants have been derived. The common buckwheat is the principal food of the peasants in Brittany.

The population of some mountainous districts of Europe, as on the Apennines in Italy, in Cevennes and Limousin in France, live part of the year on *chestnuts*. The sweet-chestnut grows spontaneously in all the central part of middle Europe, in Asia Minor, and on the Caucasus. It is also much cultivated beyond its natural limits. It requires a very prolonged heat in summer to ripen its fruit. The fruit of this tree is limited by the cold of the north of England, and by the warmth of Southern Italy, where it only grows on the mountains.

Between the tropics, in all countries but little elevated ab

the sea, there are many other vegetables which yield food to the human race. We can only mention—(1.) The *banana*, which is grown in Syria, and which, on the Andes, requires a height of not less than 6000 feet, at a mean temperature of 18° to 19° (C.) (2.) The *date palm* of Africa, where some tribes live altogether on its fruit, and which cannot ripen its fruit beyond the 39th parallel of latitude; in Spain and part of Syria; and would probably be of great importance in Southern Australia. (3.) The *cocoa-nut tree*, originally of Southern Asia, is now spread through all inter-tropical countries, like the banana. It grows best near the sea, far from which it cannot be cultivated. It requires a temperature of about 75° (F.), and consequently stops where the cereals begin. It furnishes the inhabitants of the peninsula of India, and of the island of Ceylon, with an important article of food and commerce. (4.) The *bread tree* furnishes food for the inhabitants of the South Sea Islands, where it originated. It has been successfully introduced into the Antilles, Brazil, Guiana, the Isle of France; but it cannot at present be cultivated beyond the 22d or 23d degree of latitude. Besides these we can but allude farther to the *yam* and the *manioc*.

The different sorts of fermented liquors which are eagerly sought after by mankind, are derived from a very great variety of the productions of the vegetable kingdom. Attention can only be particularly directed to the *vine*. The limits of the growth of the grape are now much further south than formerly. There is abundant evidence that it was once grown extensively in the south of England, whereas there is now no wine made even in Normandy. This change is not to be attributed to the deterioration of the climate, as some have pretended, but to the extension of civilisation, and the consequent facilities of exchange and transport. These have contributed to the abandonment of the growth of such uncertain crops as the grape, and the introduction of other plants more suitable to the different localities previously devoted to the growth of the vine. The present limit to the grape commences on the west coast of France, about Nantz (47° 20′), from whence it verges north to about Paris (49°); it then runs a little further north in Champaign, and upon the Moselle and the Rhine to about the 51st degree. From whence, with slight variations, it passes through Hungary at 48°, through the Crimea to the Caspian sea, where it disappears. The southern limit of the vine is the Canary Islands, lat. 27° 48′, from whence it follows the coast of Africa to Egypt, a small portion of which it excludes. It is abundant in Persia, but does not ripen in Japan, and would undoubtedly thrive in China, only everything is there given up for tea.

In the southern hemisphere, and in America, the cultivation of the vine has succeeded in many widely distant points. In North

America, where the first settlers found several varieties growing spontaneously, the line bounding its growth on the north stretches from the banks of the Ohio (lat. 37° N.) to New California (lat. 38° N.) Its southern limit is 26° N. lat. in the Atlantic, to 32° in New Mexico. In the southern hemisphere the vine in no part reaches the 40th parallel. New Holland is likely to be celebrated for its wines, and the Cape of Good Hope has long been known for its grapes.

In the mountains of Europe the vine is grown to the height of 1000 feet in Hungary; in the north of Switzerland 800 feet higher. On the southern Alps it reaches the height of 2000 feet; and on the southern Apennines, and in Sicily, perhaps 500 feet higher.

The localities and peculiarities of the *olive*, the *sugar-cane*, the *coffee-tree*, and the *tea-plant*, are too well known to need any further remarks; but we cannot but be struck with the way in which the previously named vegetable productions are scattered over the globe, thus contributing in so many different ways to the well-being of our race.

Task-work in England.—By W. BURNESS, London.—A very large amount of all kinds of farm-work in England is performed by contract,—so much money for so much work performed; a system which recommends itself to every one acquainted with mankind and labour. In the generality of provinces it is termed "task-work," but in some "piece-work," in others "grit-work," and in a few instances only, by its proper name, "contract-work." In this article we shall abide by the common phraseology of task-work.

A servant, if labouring under the impression that he is performing more work than he ought, not only labours reluctantly, but experiences the effects of exertion more severely upon his physical system than were he actually performing a larger amount of it in a different spirit. The task-man, who makes 2s. a day, will not be more fatigued at night than the day-labourer who makes only 1s. 8d., the expense of labour in both cases being equal; and in the majority of instances, not so much. The reason of this lies partly in the mechanical position of the labourer's body, and partly in the state of his mind.

In practice, it is generally calculated that if a labourer be able to fill 20 cart-loads of manure per day, while working at his ordinary rate, if he be paid *one penny per load*, he will increase his exertions so as to fill from 24 to 26 of equal size, and be able to continue at this increased rate without increase of fatigue. At every other species of work let upon task, the same rule holds good.

Although the above is the usual calculation of farmers, and although servants view the case in the same light, yet there is,

generally, a much greater actual difference than is here stated; for servants upon day-work very seldom perform the quantity allotted to them according to the acknowledged standard; so that task-work is much cheaper to the farmer than day-work in the majority of cases; and, indeed, more profitable, also, to servants.

The advantage, and harmonious working, of the task-system depend in a great measure upon the practical knowledge and uprightness of the master. Where the farmer is qualified to estimate the value of the work irrespective of an opinion from the labourer, and where the terms are specifically settled previous to its commencement, there is no danger to be apprehended from consequences. But it too frequently occurs that masters have only two rates of wages, one which they allow for day-work, and the other for task-work. Such men, too, are not unfrequently the greatest advocates for the task-system, and, in every instance, adopt it. If they think their labourers deserving, they pay them the task-work rate of wages; but, if otherwise, they award them the smallest of the two figures. The following example will illustrate the consequences of such a system as this:—

A certain nobleman had a bailiff who was raised to the stewardship. After his promotion, his bailiff was what some modern landlords would call a "*useful man,*" but whom others, with more propriety, perhaps, would call a "*whip-the-wind;*" and he himself continued to fix the price of labour. We observed some of his labourers one day no more than task-work-like in their movements, and, on riding past, took the liberty of inquiring how much they received for the job, suspecting that matters were very different from what they really were. On learning the amount, we intimated our apprehensions that they would fall somewhat short of the ordinary rate of day-wages. They replied, that they "*always received day-wages at bad jobs of the kind.*"

On another occasion, we took the same liberty with the same workmen, but found matters now standing very differently. On this occasion they were allowed *too much money;* and when we hinted that they were not exerting themselves so as to make something of the job, they only smiled to one another, and bluntly remarked, that although they did so they would not receive more than 2s. per day, and probably spoil the next job into the bargain.

The proper way is to proceed upon definite principles—to communicate these to the labourer, and to make him familiar with them. We found that it gave great satisfaction to our labourers to explain to them how we ascertained the value of their work, and fixed the price. It was a practical subject which came home to every one of them, and which the most obtuse was quick enough to comprehend. Tell a labouring man, or rather take his spade from him, and show him that you pay a certain price per cubic yard on certain never-failing conditions, and he will not forget your lesson, nor

prove himself ungrateful for it. Parties, it is true, are liable to err in the induction of principles to practice; but mistakes of this kind will be viewed only as venial offences, in cases where there is no departure from the principle. Errors of this kind, in place of depreciating the one party in the estimation of the other, will tend rather to enhance the worth of both. If unforeseen circumstances occur, so as to render the execution of a job more difficult than was contemplated, the labourer will exert himself to the uttermost of his abilities to make wages, stimulated by a confidence that if the opposite had been the case, no advantage would be taken of his gain when the next job of the same kind might be let to him.

Almost every species of work is capable of measurement sufficiently accurate to protect the interest of both parties; and those jobs which can only be measured with difficulty, are generally let by the "lump," or so much for finishing the job. Persons thoroughly versant with farm-work, though not perhaps with task-work, will, on a moment's reflection, be able to approximate very closely to a correct valuation of a job, allowing a man to make a given amount of wages daily. The following account of the prices paid by us and some others, will convey a general idea of the system, and the expense of labour connected with English agriculture in one of the midland counties, Huntingdonshire, supposing the labourer to make 2s. per day, exclusive of harvest.

Draining.—Drains may be divided into three classes: 1°. rivers; 2°. ditches; and, 3°. drains, properly so called.

1°. *Rivers.*—The straightening of rivers, cutting of new courses, and forming embankments, is generally done by the cubic yard, at various prices, according to the depth and breadth of the cut or embankment, and the quality of the materials excavated. The principal amount of excavation connected with river-work requires wheeling, the additional expense of which is not so great as inexperienced workmen are apt at first sight to apprehend.

One man wheeling upon level planking, and removing the excavated earth to the distance of from 15 to 20 yards, will keep two men filling to the depth of 3 feet, provided the earth dig freely, and without picking, as is generally the case along rivers in this country. The expense of this may be from 2d. to 3d. per cubic yard, according as the earth is light or heavy. A proportional increase of expense will be incurred for every additional 15 or 20 yards the earth has to be removed, requiring an additional wheeler.

Level planking at works of this kind, however, is the exception; and, accordingly, more wheelers than here stated will be required on the inclined plank, and a greater price allowed for the yard in proportion to the angle of inclination. Not only has the earth to be wheeled from the bottom of the cut to the level of the ı ow, after it exceeds three feet in depth, but has also, for the mı t

to be raised to the additional height of an embankment. The expense of filling, however, remains the same so long as the soil does not alter, and hence forms an index to the whole, which can easily be estimated upon the spot by any practical man, when once the details of the work are before him.

Where picking is required, the additional expense may be calculated in the same manner as in the case of wheeling, unless where the earth abounds in slaty stones which retard the process of filling, and thus create an additional expense of perhaps from 1d. to 2d. per cubic yard. Rock may be removed at various prices, from 4d. to 1s. per ton according to quality.

When the embankment is small, or not exceeding 3 feet high, and not opposed to a rapid stream, and where wheeling is not required, 2d. per cubic yard may execute the work. When opposed to the influence of tides or strong currents, and where the earth has consequently to be firmly rammed and securely turfed, it may cost from 3d. to 4d. For large embankments that require wheeling, the expense will be regulated by the number of wheelers required for every two fillers, as formerly noticed: in some cases it may be better to have only one filler, the wheelers going from 30 to 40 yards. Extensive work of this kind invariably falls under the inspection of regular engineers and general contractors; and to furnish particulars as to expense, properly, would require details of which our limits in this article will not admit. Small embankments under 3 feet high, along rivulets and brooks, are perhaps as often contracted for by the lineal yard, pole, or chain, as by the cubic, especially where arrangements are entered into between landlords and tenants for the execution of the work; but in all cases of this kind the solid contents always form the principle to regulate the expense of lineal measurements.

2°. *Ditches.*—The expense of opening ditches is very various, according to dimensions, and the character of the soil also. They are almost invariably contracted for by the lineal yard, pole, or chain, which enables the workmen, many of whom know nothing yet of cubic measurement, to ascertain what they are daily or weekly making.

Workmen for the most part are acquainted with the nature of the soils in the district where they reside, but it frequently happens that they are called upon to open ditches of a size vastly different from any they have previously excavated. In all cases of this kind, as well as where the workmen were beginners, the practice of the country, so far as we have seen, is for the workmen to take a few days' trial before fixing the price. This, however, is an extremely objectionable plan, more especially in the case of beginners, who must always lay their account for "an apprentice fee," according to the maxim of the workmen. The comparative success of [illegible] system, generally speaking, and from time immemorial in this

country, is no doubt to be attributed to the unsuspecting honesty of parties, coupled with the prevailing inability of either to calculate the difference of expense from the difference of the cubical contents of any given length, as a rod, or chain. But even in the case where the workmen are governed by the measure of a day's labour, reference is always had to the quantity of materials excavated from any given extent, and the amount of labour this will require; so that the most judicious plan for both master and workman is, to calculate beforehand the number of cubic yards in a rod, or chain, and then fix the price according to the dimension of the ditch, and the character of the soil through which it has to be opened; and this, it may also be mentioned, is the only method by which we can communicate an idea of the expense of works of this kind.

In contracting for the cutting of a ditch, therefore, the workman has four things to keep in view,—*first*, the hardness of the soil, and the ease and difficulty with which he can lift a spadeful; *second*, the distance he has to throw it, and the consequent size of a spadeful; *third*, the number of spadefuls in a cubic yard, lineal yard, rod, or chain, or the quantity he can execute in one day for a given sum, or 2s.; and *fourth*, the quality of the workmanship, or the amount of labour required to finish it off agreeably to any specific plan.

1°. In the first case, the amount of labour will depend principally upon two considerations. The one of these is, whether the earth requires picking or not; and the other, its adhesive character. *First*, the expense, when picking is required, will be regulated by the number of spades to every pick, and the difficulty with which the materials can be picked and thrown out. Large stones are not such an opposing obstacle as small slaty ones to either pick or spade. We have paid from 4d. to 6d. per ton for the former when thrown aside—a good bargain to ourselves, and a sufficient remuneration to the workmen for their additional trouble; but small slate-shaped fragments are, invariably, a dead loss to both parties. *Second*, clays often adhere to the spade with such tenacity, that it is necessary for the workman to keep a vessel with water beside him, in which to dip his spade; and, even with the spade thus moistened, the spadeful sometimes returns to the bottom of the cut with it, where it can only be removed by the foot. Such impediments as this may increase the expense from one-fourth to one-half.

2°. In the second case, it is necessary to attend to depths and distances. The breadth may be such as to require wheeling, the depth such as to require scaffolding, and the accumulation of the excavated materials may be on both banks, or the whole may be thrown to one side.

3°. In the third case, the cubical contents being known, t

principal point for consideration is the amount of wages. We have said 2s., and, in ordinary cases, this being the current task-wages, is all that can be reasonably expected; but in particular cases, both in ditching and river work, something extra is necessary, owing to the heavy and sometimes dirty character of the work. This is usually allowed.

4°. In cases where the ditch is small, or within certain dimensions, the depth and accumulation of earth, if thrown to both sides, is immaterial, comparatively speaking, to the workmen; but then, in cases of this kind, an additional amount of labour is incurred in dressing the sides and maintaining them at a proper angle, and this, where there is stony ground or tenacious clays, is frequently considerable.

When the earth excavated from new ditches, again, has ultimately to be removed to fill up the courses of old ones, all that is generally required is to throw it so far as to prevent the possibility of its sliding back into the cut. It frequently happens, however, that it must remain as an enbankment to prevent overflowing; and in that case it has to be turned up and left in a certain form, according to agreement, for the purpose of being sown with grass-seeds. Sometimes, again, the whole of the top spit is thrown to one side, for the purpose of growing a hedge, and the bottom thrown to the other. All these points increase the amount of labour, and consequently of expense.

The actual expense of cutting a ditch of a given size may be had from the following three examples, in all of which we shall suppose the soil, in the language of the ditcher, "*a workable clay*," neither adhering to the spade nor requiring picking, and the wages 2s. per day.

In the *first* instance, suppose the dimensions of the ditch to be 4 feet wide at top, 1 foot wide at bottom, and 4 feet in depth; in the *second*, 6 feet wide at top, 2 feet wide at bottom, and also 4 feet deep; and in the *third*, 6 feet wide at top, 1 foot wide at bottom, and 5 feet deep: the excavated earth in each case to be thrown to both sides without trimming. The number of cubic yards in a chain would be, in round numbers, 24, 39, and 44, respectively.

In the first and second examples, the depth is the same, and the difference of the sides and breadth so immaterial to the workmen, that both can be executed at the same expense, or at about one penny per cubic yard. In the last example, however, the depth is so increased that *the additional five yards cannot be executed for five-pence*, but will cost double price, or twopence per cubic yard. The expense per chain, therefore, of each of these examples may be stated at 2s., 2s. 3d., and 4s., respectively.

On some light alluvial and mossy soils, a man may excavate from 30 to 50 cubic yards per day; while on some other stony and stubborn soils, 12 to 15 may be the utmost he can attain.

3° *Drains properly so called.*—These are generally measured by the lineal chain; and the expense, as in the cutting of rivers and ditches, will depend upon the quality of the soil and the depth to which they are placed. On clayey soils, such as the Oxford of Huntingdonshire, where picking is seldom required, the expense per imperial chain for opening, putting in pipes, and covering, supposing the depth to be 40 inches, may run from 1s. 6d. to 1s. 8d. In soils of a different description, which require picking, the cost may be from 2s. to 2s. 6d. per chain. In many soils of this latter quality the drains are frequently filled with broken stones. The additional expense which this will incur may be estimated on an average at about 1s. 2d. per chain, including quarrying — or collecting, breaking, and filling into the drain, but exclusive of horsework and horseman's wages. The expense in this case, including digging, would be 3s. 2d. to 3s. 8d. per chain.

The acreable expense of draining will of course depend upon the distance between the drains, other things being the same. If we take the distances at 15, 18, and 24 feet, the depth at 40 inches, the six prices above stated, and the cost of the average size of pipes 10s. per 1000, then the following three examples will give a general idea of the expense per acre:—

EXAMPLE 1.

	Price per chain.					Total cost per statute acre.		
Distance 15 feet from drain to drain, giving about 44 chains of draining per acre—	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
No. 1. To cutting, piping, and covering, 44 chains at	1	6	3	6	0			
... 2904 pipes, at 10s. per 1000, . .			1	9	0			
						4	15	0
„ 2. To Do. Do. 44 chains at	1	8	3	13	4			
Pipes, (as before) . . .			1	9	0			
						5	2	4
“ 3. To Do. Do. 44 chains at	2	0	4	8	0			
Pipes, &c.			1	9	0			
						5	17	0
„ 4. To Do. Do. 44 chains at	2	6	5	10	0			
Pipes, &c.			1	9	0			
						6	19	0
„ 5. To cutting, filling with stones, &c., 44 chains at	3	2				6	19	4
„ 6. To	3	8				8	1	4

EXAMPLE 2.

Distance 18 feet, giving about 36 chains per acre—								
No. 1. To cutting, piping, and covering, 36 chains at	1	6	2	14	0			
... 2376 pipes, at 10s. per 1000, . .			1	3	9			
						3	17	9
„ 2. To Do. Do. 36 chains at	1	8	3	0	0			
Pipes, (as before,) . . .			1	3	9			
						4	3	9

		Price per chain.					Total cost per statute acre.		
		s.	d.	£	s.	d.	£	s.	d.
No. 3.	To cutting, piping, and covering, 36 chains at	2	0	3	12	0			
	Pipes, &c.			1	3	9			
							4	15	9
„ 4.	To Do. Do. 36 chains at	2	6	4	10	0			
	Pipes, &c.			1	3	9			
							5	13	9
„ 5.	To cutting 36 chains, breaking, filling with stones, &c.	3	2				5	14	0
„ 6.	To	3	8				6	12	0

EXAMPLE 3.

Distance 24 feet, giving about 27½ chains per acre—

		s.	d.	£	s.	d.	£	s.	d.
No. 1.	To cutting, piping, and covering 27½ chains at	1	6	2	1	3			
	... 1815 pipes at 10s. per 1000, . .			0	18	0			
							2	19	3
„ 2.	To Do. Do. 27½ chains at	1	8	2	5	10			
	Pipes, (as before,) . . .			0	18	0			
							3	3	10
„ 3.	To Do. Do. 27½ chains at	2	0	2	15	0			
	Pipes, &c.			0	18	0			
							3	13	0
„ 4.	To Do. Do. 27½ chains at	2	6	3	8	9			
	Pipes, &c.			0	18	0			
							4	6	9
„ 5.	To cutting 27½ chain drains, filling with stones, &c., at	3	2				4	7	1
„ 6.	To	3	8				5	0	10

For any other distance between the drains, the variable expense may be ascertained from the above tabular account, by doubling the price for half the distance; and for double the distance from drain to drain, by taking half the price. Thus, 12 feet distant from drain to drain would be double the expense of No. 1, Example 3, = £5, 18s. 6d.; and 30 feet distance, one half the cost of No. 1, Example 1, = £2, 7s. 6d. per acre. The expense of draining at 21 feet distant from drain to drain, will be half the difference between the second and third examples added to the third.

When the dimensions of the drain are different from those above stated, the expense will of course differ also. On clay soils of the same quality, drains may be placed to the depth of 4 feet for about 6d. per chain more money. On stony soils, a proportionally greater increase of price than the ratio between the depths and prices in the above examples, according to the hardness of the soil, will be required. When the depth is only 32 inches, the chain may be cut for about 4d. to 5d. less money; and on stony soils, a proportionably greater deduction of price.

Cleaning or scouring of ditches is generally done by the chain, at various prices according to their size and the state they are

in. This is a species of work much more difficult to estimate than the making of new ditches. The maxim here adopted by farmers is to leave the workmen upon the safe side; for experience has satisfactorily demonstrated, that the opposite plan has an infallible tendency ultimately to increase the expense of labour. Practical farmers, who can handle the spade, and who have cleaned ditches themselves, can approximate so closely to the mark as not to suffer injury, and yet leave the labourer with the lucky half of the bargain. Where the common ditches along hedgerows, &c., have been cleaned out regularly every year, the price which was given was one penny per chain, the breadth of the bottom being equal to that of the workman's spade or shovel, and proportionally a greater price for a greater breadth of bottom.

Levelling.—The filling up of old ponds and ditches is almost invariably done by the task, the former by "lumps," and the latter by the chain; so much for filling an old pond, and so much per chain for filling an old ditch. In estimating works of this kind, our plan has always been, to fix, in the first place, the price per cubic yard according to the quality of the materials; in the second, to approximate as closely as possible to the cubical contents by taking the mean breadth, depth, and length of the old banks; and, lastly, to settle the price per lump, or chain, in order to have no words on the subject afterwards, and to enable the workmen to know what they were doing daily.

In the absence of roots or stones, ponds may be filled in for one penny per cubic yard; and where wheeling and picking is required, the additional expense may be estimated as formerly noticed in river-work. Ditches, from being narrower, can be filled in for less money, the earth digging freely. It is seldom, however, that old ditches are without hedges in this country; and these often so overgrown, as rather to resemble a forest than a fence, and hence the expense of stubbing them is scarcely any criterion by which to go. Ordinary hedges may be stubbed, and the ditches filled up, a spit having first been taken out of the bottom, and a pipe put in, for about 3s. to 4s. per chain. Where trees are growing in the hedge-row, so much per tree is allowed for stubbing it in addition, according to its size.

Excavated earth from rivers, ponds, ditches, &c., for the most part require removal. Where the courses of rivers or ditches are changed, the earth from new ones is required to fill up and level the old. This is effected either by wheeling or carting, but generally by the latter, when the workmen are paid for filling by the load. The expense of manual labour in this case principally depends upon the quality of the materials. A horse is able to draw a certain weight of earth without reference to the cubical contents of the load, and therefore the strength of the team and the character of the road are points for consideration. With good roads and

ordinary farm-horses, a load of clay may contain from 15 to 18 cubic feet—of alluvial soil from 24 to 27—and of peaty from 30 to 40. The usual price per load is one penny. A proportional increase is sometimes allowed to the horseman for emptying: thus, if a horseman and his two carts keep two men filling, the price will be 1½d. for filling, emptying, and levelling. Where picking is required, the increase of expense may be calculated in the same manner.

Paring and Burning.—This old-school system of getting rid of a vast amount of vegetable matter by burning it in the open air, and hence turning it to bad account, although fast getting into disrepute, is still practised to a considerable extent in many districts of England. With the common breast-plough, the expense of paring, burning, and spreading the ashes, runs from 30s. to 50s. per acre. When pared by horse-work the turf is generally thicker and more difficult to burn, and consequently, unless the weather is very fine, the operations may sometimes cost nearly as much as for manual labour, including the wages of the horseman, as if it had been performed by the breast-plough. The cost of burning and spreading the ashes in this case may be stated at from 15s. to 25s. per acre.

Another practice similar to the above is the digging up and collecting the banks of headlands, old borders, and everything of the kind, into large heaps, and then burning them. The labourer is either paid by the load, or the cubic yard of ashes. The general plan is the former, and the average price may be about 6d. per load. Sometimes the subsoil is dug up and burned, and may cost from 6d. to 1s. per load, according to the quality of the materials. Peat-ashes cost more money, and may be stated at 2d. per bushel, or from 2s. to 2s. 6d. per cart-load.

Spade Husbandry or Culture.—1°. *Forking.*—In modern times the spade and digging-fork are likely to supersede the plough. In many counties of England, forking the stubble-lands for the ensuing fallow-crops has been introduced; and from the success which has attended the practice, it bids fair to become universal at no distant period. The work is contracted for by the perch or acre, and the expense will depend upon the depth, natural quality of the soil, and the season of operation also. Some sandy and very loose soils may, perhaps, be more easily dug during the latter part of spring and early in autumn than during winter; but clayey soils, on the contrary, in the vast majority of cases, will be the reverse.

2°. *Digging.*—Digging wheat-stubble, during winter, to the depth of 12 inches, may cost from 26s. 8d. to 60s. per acre. Digging the same over again in spring, preparatory to manuring for turnips, &c., should it require it, (which it seldom does if the land has been effectually drained, trenched, or subsoiled, and put into proper order) will cost from 13s. 4d. to 26s. 8d. Digging grass and

clover lands, as well as lands from which green crops have just been removed, will require higher figures.

3°. *Trenching.*—The expense of trenching or digging two spit deep, is much more diversified than one spit digging. Our experience of trenching in England has been very limited. The lands which we did trench were of two kinds; the first literally matted with tree roots and old stumps; and the second, the same species of soil, but free of any encumbrances of the kind. The price of the former was from 1s. to 2s. 6d. per perch, and the latter 6d., both being 18 inches in depth.

In Scotland and Ireland, our experience has been much more extensive. During two years we were in the latter country, in the employment of his Grace the Duke of Manchester, we drained and trenched upwards of 60 acres, at an average expense of £10 per acre imperial. The soil was incumbent upon greywacke, and thickly embedded with stones, affording in some places more than sufficient to fill the drains, and in others about one-half. The trenching cost £3, 4s. per acre, and the draining £6, 16s. The drains were cut 30 to 33 inches in depth, and filled from 12 to 15 inches with stones. The trenching was 18 inches. The expenses of trenching and draining, however, were conjunctly united. The fields were trenched in spaces or lots of three lands each. Each lot preceded the other, so that the stones dug up from the one served to drain the other; the workmen, in trenching, were paid at the rate of about 8d. per chain for the stones they dug up, and the breakers and fillers, for collecting them, &c., 6d., or 1s. 2d. per chain for stones altogether, as formerly stated. The collecting and carrying across the stones, and filling them into the drains, after being broken, was done by women.

Manure.—1°. *Compost.* The collecting of materials for compost, and the carting out of the same after being made, is paid for by the load: a penny is allowed for filling in both cases, and a penny for spreading; and, generally, a halfpenny for trimming the compost hill when collecting, and the same for emptying, when putting it upon the field in small heaps.

The mixing, turning, and making of compost, is sometimes a work of greater difficulty to estimate than the cartage of it upon the field afterwards. This arises from the character and diversity of the compound; and hence any idea of a standard price is, in most cases, unattainable. The general plan of the country is to appeal to a trial, when parties cannot be guided by previous experience. After the labourer ascertains how much he can perform in a day, he makes a proposal to his employer, which is either accepted or modified as he thinks the circumstances demand.

When the compost has simply to be turned over, or only mixed with farm-yard manure, the amount of labour is more easily ascertained. We always agreed by the cubic yard, measuring the hill

sometimes before it was turned and sometimes after, according to its quality. When fresh materials are added during the process of turning, it must be measured after the whole is finished; but when otherwise, it is better done before the commencement. For the former we gave a penny per cubic yard, and for the latter from a penny to a halfpenny.

2°. *Farm-yard manure.*—The filling of farm-yard manure is invariably paid for by the load, and sometimes the whole amount of manual labour in carting it out from the yards. The expense of filling in the farm-yard is a penny, trimming at the dunghill in the field to the height of 7 feet, and backing one of the horsemen's carts, one halfpenny, and the horseman's hire for carting it out, according to the distance. The following account of carting out manure from a farm-yard during frosty weather will convey an idea of the whole expense of manual labour and mode of procedure.

In this example, the distance between the farm-yard and field was such as to require four teams to make a full set, each horseman having two single carts. To man these we found it required five men besides the horsemen, making a total number of nine men at the work. Three of the five men were in the farm-yard filling—two at one cart, and one with a horseman at the other—and two at the dunghill, trimming and assisting to empty. The horsemen were thus placed: one in the farm-yard, with his two carts filling; one driving out two loaded carts; one returning with two empty ones; and one at the dunghill emptying—himself one of his carts, and one of the trimmers the other. Each horseman went six turns at a yoking, twelve at two yokings, making a total of 96 loads daily for the eight carts. The expense of this, according to the prices already stated, would be 18s., or 2¼d. per load for filling, trimming, and carting, exclusive of horse labour.

Sometimes, instead of the manure being trimmed or thrown up loose in the dunghill upon the field as it is carted out, to undergo immediate fermentation, it is carted over, and trampled by the horses' feet and cart-wheels, to prevent fermentation. In cases of this kind, one man upon the dunghill will be sufficient, and the total expense per load consequently 2d.

3°. *Covering dunghills with earth.*—When manure is carted out as above, it should always be covered with from six to nine inches of earth. This is sometimes done by the lump, sometimes by the rod or chain, and sometimes by the number of lands. Turnip and potato binns are covered in the same manner, and therefore we shall include both under this paragraph. Contracting according to either of these plans is a very indefinite mode of procedure. Dunghills and potato binns are seldom of the same dimensions two years in succession. A cart-load is one thing to cover in the case of a large binn, but a very different thing to cover in that of a small one of perhaps half the size; and the same may be said of a

rod or a chain. The previous practice we found had been an appeal to trial, and generally the parties were unable to fix the price until Saturday night, when payment was to be made, at which time the whole was entered in the books in the gross, at so much per job, without any reference whatever to measurement. The impropriety of such a system needs no comment. Its injurious effects upon the industrious habits of the workmen are palpable. If a farmer wants so many inches of earth put upon a dunghill or potato binn, what can be more simple than to measure it? For instance: if six inches is the depth required, then six square yards make one cubic yard; and if nine inches—only four for clayey soils, where in general three tramps of the foot are required to put the spade into the ground: it will require 2d. per cubic yard to finish the work in a workmanlike manner, and, when the ground is more easily dug, a proportionally less price.

4°. *Turning manure in yards or hills.*—The expense in both cases will depend upon the quality of the manure. If the dung is short, from having already undergone considerable decomposition, it may be executed at about three farthings per cubic yard; but if otherwise, and the straw comparatively fresh and difficult to separate, a penny will be found small enough. A man will fill a cart, containing 1¼ cubic yards of such dung, with as much freedom as he will turn over one yard when confined to a narrow trench.

5°. *Manuring, &c.*—The expense of task-work in the manuring of fallow lands, either for green or corn crops, is almost the same as that stated already in forming the dunghill. A penny per load is allowed for filling as formerly, and the same price for spreading. Along with farm-yard manure, guano, bones, and other artificial substances are largely used. These are generally sown with machines, but sometimes also by the hand, upon the top of a slight manure from the farm-yard. For hand-sowing we paid sixpence per acre, the men sowing one drill at a time or cast. When horsemen are paid by the task, it is more convenient to agree with them for so much per acre than per load. The following two examples will furnish an idea of the expense of manual labour per acre, for laying down a field in turnips, the work being done by the task; the *first* with mixed, and the *second* with farm-yard manure alone.

1. In this example, let the quantity of manure be 12 loads per acre from the farm-yard, and 3 cwt. of guano. The most profitable arrangement in this case, to avoid interruption and change, would be to employ seven men, four boys, and seven horses. Four of the men would act as horsemen, the *first* making drills—the *second* carting out and emptying manure from the dunghill—the *third* covering manure, and the *fourth* with the odd horse taking out guano, sowing seeds, and rolling the sown land with a heavier roller, rolling by the turnip-machine being seldom sufficient pro-

perly to compress the soil. The occupation of the other hands would be two men filling dung, four boys spreading, and the other man sowing guano. The horses would accordingly be thus employed,—two pairs drilling, one pair in the dung carts, and the odd horse at sundries.

At the commencement of the operations, it is necessary to give the first plough a yoking in advance, in order afterwards to avoid confusion upon the head-lands with the dung-carts. In distributing the dung from the cart, some farmers take three drills and others five; but the former is the most advantageous number, as it admits of the least possible loss by exposure of the manure to the influence of the atmosphere, and enables the horseman to proceed after he has taken out his end-board and righted his cart upon the upsetter to empty without again having to stop his horse until the load is wholly disposed of in the middle drill of the three. The four boys spreading, follow closely after the dung-carts—one throwing out and three breaking, one in each drill. The third horseman follows hard up covering with the man sowing guano before him. The fourth concludes the operation by sowing and rolling. The set will easily finish 4 acres daily, giving two five-hour yokings. The expense per acre will therefore stand thus:—

	s.	d.
Twice drilling, at 6d. per acre, . . .	1	0
Emptying dung, at 6d. „	0	6
Sowing guano, at 6d. „	0	6
Sowing seeds, &c.	0	6
Filling and spreading 12 loads of dung, at 2d. . .	2	0
Total, . . .	4	6

2. In this example let the quantity of farm-yard manure be 18 loads per acre. The only alteration which will be necessary in the strength and arrangement of the set, will be three men filling dung, three carts carrying out, with an additional boy driving the intermediate cart between the dung-hill and the field, and also a man or stronger lad to throw out the manure, along with the other three breaking. The expense per acre will now stand thus:—

	s.	d.
Twice drilling, at 6d.	1	0
Emptying dung, at 6d.	0	6
Sowing seeds, at 6d.	0	6
Filling and spreading 18 loads, at 2d. . . .	3	0
Boy driving intermediate cart, . . .	0	1½
Total, . . .	5	1½

Sowing of seeds.—The sowing of corn and the seeding of the ground may be either performed by manual labour or by horse-work. In the former case, it may be either sown broad-cast by the hand, dibbled by dibbling machines, and drilled or sown

broad-cast by barrows. In the latter case, horse-machines are of different kinds; some are constructed for sowing broad-cast, some for drilling, and others for dibbling. The manual labour attending machines of this kind is generally performed by the horseman on day-wages.

Where the work is performed by manual labour, it is usually done by the task. For sowing wheat, barley, and oats broadcast, we gave 2d. per acre; and for grass seeds the same price—the sower, however, giving three casts to the land or ridge, instead of only two as with corn. Broad-cast barrows are principally used for sowing grass seeds; and the expense will depend upon the level nature and softness of the ground, coupled with the character of the machine. Drilling barrows are principally used for sowing beans, and are now almost entirely supplanted by horse-machines. Dibbling with the old machines, when boys and women dropped the seed after the dibbler, the expense per acre varied with the distance between the lands, and may be stated at from 5s. to 7s. 6d. for wheat, oats, or barley; and from 3s. 6d. to 4s. for pease and beans. Dibbling machines are now constructed of endless variety, which deposit the seed themselves, and which may, therefore, effect a saving of about one-third of the former price.

Hoeing.—Although hoeing corn crops will never, in all probability, become the practice in Scotland, we may be permitted to state the price at this place.

1°. For hoeing wheat we paid from 2s. 6d. to 4s. per acre; oats, 2s. 6d. to 3s; and pease, 1s. 8d. to 2s. 6d. Beans, when grown upon light and kindly soils, may be hoed for the same money as pease, or from 2s. to 2s. 6d.; but, upon many soils, when they are extensively cultivated, the cost may be considerably higher. On some stiff tenacious clays, the expense of hoeing the first time may cost from 3s. 6d. to 4s.; and, for the second time, from 2s. to 3s.

2°. *Potatoes*—When grown in drills, horse-hoed, and scuffled, may be cleaned between the plants afterwards for about 2s. the acre.

3°. *Turnips.*—Some farmers continue to sow on the broad-cast system, but the majority have adopted drilling, although on various plans,—some drilling on the flat at various distances from 12 to 28 inches between the drills, others raising the drills upon the Scotch system. All these plans affect the amount of labour in hoeing, and consequeut expense.

When drilled in ridges 28 inches apart, and horse-hoed, the price varies from 2s. 6d. to 5s. per acre, or from a halfpenny to a penny per 100 yards of drill-sowing. For the second hoeing, from one-half to two-thirds of the price of the first may be given as a general rule.

Estimates by the drill will be found more convenient in practice than by the acre; for where there are a number of hoers, it sel-

dom happens that the field can be subdivided into lots, partly from the horse-hoeing in front, and partly from the size of the plants. It also saves a great deal of measuring. All that the farmer has to do, where this plan is adopted, is to count the number of his drills in every field, and take a note of them. Each hoer will look after his own number; and where the system of task-work prevails, the length of each field is accurately known by both parties, and the number of acres in it.

Harvest-work.—1°. *Hay-crops.*—The prices which we paid for mowing ryegass and clover, were from 20d. to 2s., to 2s. 4d., being on an average 2s. per acre. For meadow-grass, from 2s. 6d. to 2s. 9d. For tedding or shaking out meadow-grass from the swathe, 6d. per acre. For filling small loads of hay, whether ryegrass or meadow, 2d. per load of about 10 cwt.

The above prices are exclusive of an allowance of three pints of ale and two of table-beer daily for each man. The usual wages which workmen make during hay-harvest are from 2s. 6d. to 3s., exclusive of ale,—working extra hours, or from 5 o'clock A.M. to 7 o'clock P.M.

2°. *Corn-crops.*—These are either mown or reaped. The principal breadth of wheat, perhaps, is cut down by the reaping-hook and sickle. Oats and barley are invariably mown, unless where the former is cut by Irish reapers.

The reaping of wheat is performed in a very rough and hurried manner, leaving, for the most part, two-thirds of the straw upon the ground. We had none reaped in this manner; but the usual price, where the wheat is standing upright, is from 8s. to 10s. per acre, and, when the crop is lodged, from 10s. to 12s. After harvest the stubble is mown and collected into heaps for about 2s. per acre. It is then either carted home and stacked for litter, or burnt upon the field. The former is the general practice. To Irish reapers we gave from 10s. to 12s. per acre for cutting wheat, and from 9s. to 10s. for oats, both crops being bulky, lodged, and cut low.

The operation of mowing wheat is performed differently. Sometimes the mowers follow each other in the same manner as in mowing grass, which is termed "mowing out from the standing corn;" sometimes they reverse their position, turn their left hands to the unmown corn, which is termed "mowing up to the standing corn." Sometimes two or more mowers follow each other, with regular sets of gatherers, binders, and rakers, finishing the work as fast as it is mown. For cutting wheat in this manner, the crop being of ordinary bulk, we paid as follows:—Mowing, 2s. 6d.; gathering, 1s. 6d.; binding and shocking, 2s.; raking, 6d.—Total, 6s. 6d. For heavier crops and lodged, as high as 9s. Sometimes, again, the mowers go singly, each taking the particular lands the farmer may think proper to allot to him. We gave the same ... per a... ... his plan ... n the other.

When each workman goes singly by himself, as in the last case, he has two advantages, *first*, the employment of his wife and family, if married—or a sister if not; and, *second*, the full benefit of the breadth of swathe which he cuts, which is sometimes considerable, for some mowers cut a much narrower swathe than others do.

It has also advantages to the master; *first*, that men require less looking after, each man's work appearing by itself; and, *second*, that when corn is much broken down and lodged, less damage is sustained from the mowers' scythes. When four or five scythes are pressing hard upon each other, with scarcely two strokes between them, a false stroke on the part of the foremost is one to all the followers, so that to go forward, if possible, without regard to threshing or handling the crop, is almost an excusable step, at least in the eyes of the labourer; but, when going singly, the best plan for the one is the quickest for the other, and which is, to take the corn as it lies, whether it be round about or forward.

For mowing, tying, and shocking oats, we gave the same price as for wheat, the crops being more bulky and lodged. Barley is seldom bound up in sheaves and shocked. It is harvested in the same manner as rye-grass, and costs for mowing 2s. to 2s. 6d. per acre. Mowing tares costs about 2s. 6d. Hooking pease, 3s. 6d.; and cutting or pulling beans, from 4s. to 7s. per acre.

The above prices are all stated exclusively of the allowance of ale and beer already noticed. Instead of ale, money equivalent in value is frequently given per acre. We gave, in one case, 1s. 2d. per acre. Sometimes, again, an allowance of malt or money is given for the whole period of harvest, or four weeks, termed the harvest month provincially. In some districts cider is used instead of ale.

The drinking largely of ale and cider is, perhaps, peculiar to the labouring population of England. The allowance made to them during harvest is no doubt well meant, and, to a certain extent, absolutely necessary, but, like all other good things, the boon has been very much abused in numerous instances. Much more importance has been attached to it by both master and servant than sober inquiry will justify. Hard work requires eating as well as drinking, and that of a peculiar quality. Nothing of this kind is allowed elsewhere.

3°. *Root-crops.*—The pulling, topping, and tailing of mangold-wurzel and turnips is best done by the drill, the same as in the case of hoeing. The following are the prices we paid, but stated per acre:—Mangold and swedes, 5s.; globe, 3s. 6d. For filling the load of bulbs, one penny. The weight of mangold-wurzel was 26 tons per acre, swedes about 30. A load of the bulbs of the former weighed 17 cwt., one of the latter about the same.

The prices in the foregoing account of task-work are principally taken from the writer's private cash-book. A great many items

have been passed over as being of too trivial a character, or only locally applicable.

Analysis of a soil containing a large quantity of sulphate of iron. By Dr A. VOELCKER, Professor of Chemistry, Royal Agricultural College, Cirencester.—A short time ago a sample of soil was sent to me by a friend for examination. The soil he described to me as one of the very worst that could be met with, as one which would absolutely grow nothing whatever. He desired me to investigate the cause of its barrenness, and to point out, if possible, a remedy by means of which it might be improved. On analysis, I soon discovered the cause of its barrenness; and as this case may serve as an illustration of the services which chemistry is capable of rendering to the farmer, I think it not unprofitable to give publicity to the subjoined analysis. The sample of soil sent to me was taken from a field belonging to Mr Tongue of Torton Cottage, near Lancaster; and the place whence it came, Mr Tongue repeatedly observed that peas sown in it rotted, and naturally concluded that there was something injurious in the soil.

This soil is of greenish-black colour, and contains nearly 75 per cent of pure quartz sand, and very little alumina, for which reason it is very open. Mixed with water the quartz sand settles first at the bottom of the glass, and above it a quantity of an almost black light organic matter was deposited after some time. This organic matter, being very light, remained floating in the liquid a considerable time, and may therefore be easily separated from the quartz sand which settles very readily. The watery solution of this soil, when concentrated, had a bluish colour, and deposited, on heating, flakes of oxide of iron, assumed a brownish colour, and gave, on evaporation, a residue which turned black on burning, and gave off a smell of burning organic matter. The proportion of organic matter soluble in water appeared to be considerable. Chloride of barium produced at once a heavy white precipitate in the watery solution; and ammonia a greenish precipitate, which, collected on a filter, rapidly changed its colour into red-brown. Red prussiate of potash produced an abundance of beautifully blue-coloured precipitate.

These reactions indicate the presence of a considerable quantity of sulphate of protoxide of iron in the organic matter of the watery solution of the soil.

Some of the substance, insoluble in water, moistened with muriatic acid, gave off a strong smell of sulphuretted hydrogen, which gas escaped under effervescence; the black colour of the insoluble part in water disappeared in a great measure on the addition of muriatic acid.

Another part of the insoluble matter (in water) of the soil, heated in a closed platinum crucible, turned coaly, and gave off a

very strong smell of burning sulphur. Heated afterwards in an open platinum dish, all the organic matter burned away, and the quartz sand, mixed with a portion of oxide of iron, which gave a red colour to the mixture, remained behind.

The following results were obtained on the quantitive analysis of this soil:—

PART SOLUBLE IN WATER.

Sulphate of protoxide of iron,	6.41
Sulphate of lime,	0.35
Alkaline salts (chiefly sulphates),	0.62
Soluble silica,	0.13
Organic matter,	0.93

PART INSOLUBLE IN WATER.

Organic matter and sulphur driven off by heating the part insoluble in water to a red heat,	9.05
Oxide of iron,	5.45
Alumina,	0.80
Phosphoric acid,	0.03
Carbonate of lime,	0.24
Carbonate of magnesia,	0.57
Insoluble siliceous matter, chiefly quartz sand,	75.11
	99.69

I need hardly observe, that the quantity stated of organic matter in this analysis must be regarded as only an approximation, and that the iron, calculated as per-oxide, was not contained as such in the soil, at least not for the greater part.

The large amount of sulphurous acid given off by heating to redness the part of the soil which was insoluble in water, would make it appear that the greater part of the iron was contained in the soil as bi-sulphuret of iron or iron pyrites; and the evolution of sulphuretted hydrogen by muriatic acid, and the change of the black colour of the residue into a lighter colour, shows likewise the presence of a quantity of sulphuret of iron—a combination which is easily decomposed by weak acids.

In order to determine quantitively the whole amount of sulphur present in any form in this soil, I oxidised, weighed, and dried a quantity of it, by means of fuming nitric acid, and determined the quantity of sulphuric acid thus produced, as sulphate of barytes. In this way I found that 100 parts of dry soil contained as much sulphur, in various combinations, as that 15.81 per cent of sulphuric acid were formed when the sulphur was completely oxidised.

Sulphate of iron, or green vitriol, a salt which is considered very injurious to vegetation, is produced by the oxidation of the iron pyrites, which is present in the soil in considerable quantities. When iron pyrites is exposed to the air, it slowly absorbs oxygen, and is converted into sulphate of iron and sulphuric acid, which acid, in contact with decaying vegetable matters, parts with its oxygen to the carbonaceous matter, giving rise to various organic combina-

tions, and to sulphuret of iron (Fe. S.), substances which are all very injurious to vegetable life.

Sulphate of iron is easily decomposed by quicklime, and changed into oxide of iron and sulphate of lime (gypsum), two substances which are found in all fertile soils. Quicklime, further, is known to destroy an excess of organic matter. The application of quicklime, with perfect drainage, therefore, would be an easily available means by which a soil of similar composition as that analysed can be rendered fertile. The consequent application of clay-marl, if at hand, would be a further means of improving the fertility of such a soil, as it tends to render it more solid and tenacious.

Manuring Trees. By Mr P. MACKENZIE, West Plean, Stirling.—In the "*Theory of Horticulture*" we are informed that wood, properly so called, and liber or inner bark, consist, *in exogens*, of the perpendicular system for the most part, while the pith and external rind or bark are chiefly formed of the horizontal system. The two latter are connected by cellular tissue, which, when it is pressed into thin plates by the woody tubes that pass through it, acquires the name of medullary rays. It is important for the due explanation of certain phenomena connected with cultivation, to understand this point correctly, and to remember that, while the perpendicular system is distributed through the wood and bark, the horizontal system consists of pith, outer bark, and the medullary process which connect these two *in exogens*, and of irregular cellular tissue analogous to medullary rays *in endogens;* so that the stem of a plant is not inaptly compared to a piece of linen, the horizontal cellular system representing the woof, and the woody system the warp.

Although investigators in natural science differ in their opinions respecting the mode in which vegetables receive certain substances into their composition, and fitted for their wellbeing, some say by the leaves, others by the leaves and roots, yet they agree that carbon and nitrogen are of great importance to promote healthy vegetation; and it ought to be the business of cultivators to secure a supply of sufficient food for the trees under their care. This is not always easily accomplished; but much might be done that is not done to promote healthy plantations.

It is well known that forest trees, such as oak, elm, plane, beech, &c., will not thrive long in certain soils if they want what they should have. They show marks of decay, and, if not prevented, will soon require the axe to be laid to their roots.

Some time ago I sent a notice to this Journal how some trees might be improved by applying liquid manure to their roots. I have since made a few experiments and observations how such trees might recover their health and become useful and ornamental to those who possess them. The want of proper nourishment either

to vegetables or animals soon shows itself in one way or another; and food applied even in a rough way is to all appearance greedily received, when animated beings are in want of it. The trees we intend to make a few remarks upon, had fallen into a languid state through want of food; or, in other words, the soil appears to have been worn out by means of the crop that grew upon it. In a hollow part of the wood, where some elms and other trees were planted some years ago, symptoms of decay manifested themselves in a very prominent form,—such as the leaves turning yellow early in the season, and falling off, when others in a more healthy state remained longer to perform the office assigned them. Leaves in such a state make little wood for the tree that bears them: the young shoots apparently never ripened their wood, for many of them died, and the trees altogether had a decaying appearance.

The hollow ground was used to put rubbish in that came from the garden and other places. It was thought at first that the rubbish would kill the trees, by burying the roots too deep; but much that was put there was of vegetable origin, which soon decomposed, and, being of a porous nature, did not prevent the air from reaching the roots; and instead of injuring the trees, they soon began to show signs of improvement. Their health recovered rapidly; their leaves expanded in length and breadth; their shoots did the same; and their leaves, instead of being the first to droop in the autumn, continued to hold on as long as most deciduous trees do. From these observations we may learn, that even old trees may be made to have a healthy old age; and young ones that have set prematurely in their growth, from want of proper soil to grow in, or some deficiency in the constituent parts of the soil, may be made either by liquid or solid food to resume a healthy state, and may live, from generation to generation, a shelter and an ornament in the place which they occupy.

Some may be ready to ask the question, how such rough treatment and rough materials could benefit forest-trees? Perhaps the answer may be best given from a late number of this Journal, where it is said that "all the decaying organic substances present in the soil are principally derived from the two chief constituents of organised being, woody fibre (including starch, gum, sugar) and protein compounds. The composition of the former is either

	C 24	H 21	O 21	
Or	C 12	H 10	O 10	
Of the latter,	C 40	H 31	O 12	N 5

Now, in whatever way the decay of these substances in the soil be conceived, the main products being humic, ulmic, and crenic acids, there will always be a large excess of hydrogen, which, being in the nascent state, has all its properties unweakened. It is, moreover, set free amidst a decaying and porous organic substance, with a limited access of air, and at a low temperature—conditions

essential to effect the productions of ammonia, and to prevent that of nitric acid. The decaying organic matter sets free carbon, hydrogen, oxygen, and a little nitrogen. The carbon obeying its strongest tendency in this condition, forms carbonic acid, in so far as it can find oxygen enough present in the air which is continually circulating through the porous soil. The small remainder of carbon, if a sufficiency of oxygen cannot be procured, will combine with part of the hydrogen, and hence the quantity of carburetted hydrogen in marshy places, and stagnant waters. The remainder of the hydrogen takes the nitrogen simultaneously liberated from the plant, and also from its intimate mixture with the oxygen in the atmospheric air, and thus ammonia is formed. This ammonia, the extraordinary affinity of which for humic, ulmic, and crenic acids, is well known, combines immediately with part of the decaying substances, when still in the state of humus, either extracting or producing humic and ulmic acids, with which it forms humate and ulmate of ammonia so extremely soluble in water, and fit for progressive decomposition within the cellular tissue of the plants."

There are few crops cultivated either in the field or the garden, but the ground in which they are intended to grow receives preparation in one shape or other; and why should the soil in which forest-trees are intended to come to maturity remain an exception to the general rule? It will be of little service, in every case to break up the soil for young plantations; for, in some soils, trenching before planting appears to do little good; but in most places where water is abundant, forest-trees seldom make much progress, and often does more harm than good; so that draining is often of great advantage where young plantations are making: the difference in the appearance of the trees showing plainly enough which soil the plants delight in.

Even in very poor soils, forest-trees might receive more nourishment than they commonly obtain. By the mode in which they are treated, they are, in a great measure, deprived of two sources of food. *First*, From that which they might receive from the decay of the vegetables among which they live. It is a very poor soil indeed that has no herbaceous plants of some sort or another covering the surface of the earth into which the young plants have been put; and their annual decay must afford some nourishment to the young plants when they have room to grow; but by means of thick planting, the coarse herbage, among which the young forest-trees are put, gets in a manner smothered, and, like other plants, will not thrive when shut out from light and air, so that, in a short time, they are deprived of life by the shade of their more lofty neighbours; and their arborous companions suffer in their turns, when part of their nourishing supply is cut off.

Second, From what they might receive from themselves, there are few cultivators of plants, from the grower of the pine-apple

to the pansy, but knows something about the value of leaves as a manure; and the annual fall of the leaf must help, in a great measure, to manure forest-trees. This source of nourishment is also much curtailed by means of thick planting: a tree that has room to grow will produce a much greater supply of leaves than trees that are crowded together. In the one case, the trees that have room to grow may be almost feathered to the ground with branches in a healthy state, bearing abundance of leaves; in the other may be seen a few branches struggling for existence near the top of the tree, while the under branches are dead, and dying, injuring the trunk with their rottenness, without imparting nourishment to the roots.

The Quantity of Ammonia in the Atmosphere. By FRESENIUS, in the *Annales de Chimie.*—Many eminent chemists, with Liebig at their head, have attempted to show that the atmosphere contains as much ammonia as plants require: they have also very nearly, if not positively, affirmed that no other supply than that so furnished was necessary to vegetation. Without entering into any discussion as to the truth of the latter part of this position, the experiment detailed in the following paper by Fresenius is not without interest, as being the most careful attempt to ascertain the absolute quantity of ammonia present in the atmosphere.

Liebig, in his *Agricultural Chemistry*,* says that he has failed to detect ammonia in the air by any of the usual processes, but that he obtained it by examining rain and snow water. Liebig, however, only proved the presence of ammonia, without ascertaining its relative quantity.

Graeger, as quoted in Johnston's *Agricultural Chemistry*, concluded that 5,000,000 lb. of air contained 3 lb. of carbonate of ammonia: "This determination," says Johnston, "is open to correction and confirmation." †

Mulder says,‡ "It is impossible that plants should obtain their ammonia from this source—that the quantity of ammonia in the atmosphere is exceedingly small, and that, in fact, it should not take any higher rank, as regards organic nature, than the many other substances accidentally mixed in minute quantity with the atmosphere. The atmosphere contains a quantity of ammonia, which as yet it has not been found possible to weigh, and which, to organised nature, is but of secondary importance."

As already remarked, we shall not here enter into any discussion respecting the importance of ammonia, further than that, in our opinion, the truth lies midway between Liebig and Mulder. We will now proceed with the paper of Fresenius, as far as it is inte-

---

* *Agric. Chemis.*, 4th ed., p. 44. † *Lectures*, 2d ed., p. 275.
‡ *Chemistry of Animal and Vegetable Physiology*, p. 102.

resting to the general reader. He quotes the experiment by Graeger above referred to, and also some by Kemp, an Irish chemist, who seems to have obtained a quantity more than eleven times as great as Graeger had found.

Fresenius arranged two sets of apparatus. By means of the one he examined the air during the night, and by the other, that of the day.

The experiment was continued during forty days of the months of August and September 1848. Of these forty days, seventeen were fine, thirteen cloudy, and ten rainy; of the nights, fourteen were fine, eighteen were cloudy, and eight rainy. The quantity of air which daily passed through the apparatus was, in the month of August, about 87,640 cubic inches; in September, about 40,000 cubic inches. The air which passed through the apparatus during the forty nights was nearly the same in amount.

The following table shows the result:—

In 100,000 parts—

Graeger obtained of ammonia,	0·333	=	carbonate of ammonia,	0·938
Kemp do do.	3·880	=	do.	10·370
Fresenius, during the day,	0·098	=	do.	0·283
do. during the night,	0·169	=	do.	0·474
Averaging . . .	0·133	=	do.	0·376

These results are in the following proportions:—

Fresenius.			
Day.	Night.	Graeger.	Kemp.
1	1·7	3·4	37·5

Fresenius concludes with the following remarks:—

I am far from over-estimating the value of my experiments, though I have taken the utmost possible care to insure accuracy. However, I cannot but conclude that previous researches have given much too large a result. If the calculations of M. Marchand be admitted to be correct, then the whole atmosphere will weigh 5,263,623,000,000,000,000 kilogrammes; and of this, supposing my experiments to be correct, the air will contain 4,079,042 kilogrammes of ammonia.—(Kilogramme = 2.205 lb. troy.)

There is one result of these experiments which is deserving of some notice. It appears that *the air during the night contains nearly double as much ammonia as it does during the day.* Should future research corroborate this result, we would conclude, not as Fresenius has done, "that the dew which falls at sunrise dissolves the ammonia accumulated during the day and night previous," but that, during the night, vegetation, for want of the assistance of sunshine, is not able to decompose the ammonia, and which consequently accumulates. Should this difference in the constitution of the air be established by future researches, it will, we think, establish the usefulness of the atmospheric ammonia, in opposition to Mulder, without, however, establishing its paramount importance as maintained by Liebig. This view of the case is strength-

ened by a precisely similar variation having been observed in the carbonic acid of the atmosphere. M.B.

*Murphy's Farmer's Class-Book.**—This little work has been written in the belief that, if we would build up the edifice of sound agricultural knowledge, the foundation must be laid in school. It is adapted, therefore, to the youthful pupil, and it is intended that he should make it his study along with the other elementary works which then engage his attention. In establishing an agricultural school near Dublin, the author experienced the want of a class-book, which might safely be placed in the hands of agricultural students, and the present treatise is intended to supply that desideratum. The theory, science, and practice of agriculture are successively treated of, and all the subjects which claim the attention of farmers passed in review. The principles of sound agriculture seem to be clearly laid down in simple and perspicuous language; and each chapter is followed by a series of questions, on the plan that has been long familiar to teachers in other elementary works.

We are not ourselves sanguine that an improved race of farmers will be reared by any information they may obtain in school; but it may be useful to put such works as the present into the hands of young people to increase their store of useful knowledge. Such as are inclined to use a regular text-book for that purpose, will find this little work well calculated to answer the end. We shall extract the chapter on flax, as a specimen of the way in which the author handles his subject:—

It is asserted that the sum of nearly six millions sterling is annually paid by the United Kingdom to foreign countries for flax and flax-seed; and although, in order to produce such an enormous quantity, it would be necessary to withdraw a vast extent of land from the cultivation of corn, yet, as it is probable that the price of oats after a few years will be very low, and especially as the soil and climate of this country are peculiarly suited to the cultivation of flax, and as the preparation of it for market affords a great deal of employment suited to the farmer's family, it is well deserving of his serious attention.

Flax thrives best on a deep, dry loam, not too elevated; but, by careful preparation, good crops may be produced on almost any kind of land, not excepting even bog.

The proper place in the rotation is after a corn crop, which was grown on lea, or on land manured for a green crop.

The preparation of the land consists in ploughing or digging it deeply in the autumn; cross-ploughing, harrowing, and rolling, in the beginning of April, leaving the land quite level, and carefully collecting and removing all root-weeds.

The Belfast Flax Society gives the preference to Riga seed. The best season for sowing is the beginning of April. The seed is to be sown broad-cast, at the rate of two and a half bushels per statute, or four per Irish acre, which is a large quantity; but thick sowing is necessary in order to produce a fine and even sample. The seed may be covered with a light grass-seed harrower, or fine bush harrow, and rolled.

---

* *The Agricultural Instructor, or Farmer's Class-Book;* being an attempt to instil the principles of correct agricultural practice into the minds of the rising generation of Farmers. Adapted to the use of schools and young farmers. By Edmund Murphy, A.B. Dublin: James M'Glashan.

The after management consists in keeping the crop free from weeds.

Early in August the flax will be fit for pulling, which is indicated by the straw assuming a yellowish, and the seed a brownish hue, and by the decaying of the leaves on the lower part of the stem.

In pulling, the taller may be separated from the shorter flax, by laying hold of each handful high up, and afterwards pulling that which remains. The roots should be even, which the puller may effect by pressing each handful against his breast.

As the crop is pulled, if the intention be to water it immediately, it should be rippled—that is, the seed-vessels pulled off by drawing the tops through an iron comb. It is then to be tied in small compact sheaves, and taken to the pit, which should be excavated in clay land, and in such a situation, if possible, that the water, after steeping the flax, may be made to flow over the land beneath it. In this pit the flax is to be placed in a slanting position, roots downwards, and the tops loaded with sods or stones, so as to keep all beneath the surface of the water. A small rill should run into the pit during the time the flax is being steeped.

In ten days or a fortnight, more or less, according to the nature of the water and state of the weather, the "retting" process will have been effected, which may be known by the woody part separating cleanly from the fibre. It is then to be carefully raised, and left for a short time on the bank to discharge the water, and then to be taken to a field of short grass, and spread thinly and very evenly, where it may lie for a fortnight or so, being turned so that both sides may be equally bleached; and, when quite dry, and the woody part easily separates from the fibre, it is to be taken up, tied in sheaves, and stacked, and is then ready for the further process of beetling and scutching.

The seed, with the seed-vessels called "bolls," being separated from the flax by the ripple, and riddled to remove leaves, &c., are to be spread in the sun, or should the weather be wet, under cover, and kiln-dried, so that no danger of their heating is to be apprehended, and then stored for feeding cattle, for which they are of great value.

When it is intended to save flax-seed for sowing, the flax must be allowed to become a little farther advanced towards maturity before it is pulled. It is then to be stooked, not being tied in sheaves, and, when quite dry, it is tied in sheaves, and may be threshed, or stacked and threshed at any future period, and watered the following spring or summer. This is called the "Courtrai system;" but it does not appear to be gaining ground in this country.

The average crop, on ground of medium quality, and carefully cultivated, may be stated to be 40 stones of marketable flax per statute, equal to 65 per Irish acre.

*Raynbird's Agriculture of Suffolk.**—We have been much gratified by the perusal of the *Messrs Raynbird's Agriculture of Suffolk.* Miscellaneous, desultory, and diffuse, it puts us, notwithstanding, in possession of much useful information, and gives a very accurate idea of the state of husbandry in the interesting county to which it refers. The nucleus of the work is a Report on the Farming of Suffolk, which was approved of by the Royal Agricultural Society of England, and printed in their transactions. The additional matter in the present volume consists of a review of the former state of agriculture in the county—the opinions of different correspondents upon the present state of Suffolk agriculture—memoirs of celebrated agriculturists, or agricultural mechanists, including a life of the well-known Arthur Young—a description (illustrated with wood-cuts) of the agricultural machines invented or manufactured in the county—farmers' clubs—the agricultural labourer,

* *On the Agriculture of Suffolk.* By William and Hugh Raynbird. Including the Report to which the prize was awarded by the Royal Agricultural Society of England. London, 1849.

&c. Both Tusser and Young were connected with the county of Suffolk, the family of the latter having long resided on their estate at Bradfield Combust, near Bury St Edmunds; and Tusser, though born in Essex, soon came to reside in Catwade, a hamlet of Brantham, near Ipswich.

> When court 'gan frown, and strife in town,
> And lords and knights saw heavy sights,
> Then took I wife, and led my life
> In Suffolk soil.
>
> Then was I fain myself to train
> To learn too long the farmer's song,
> In hope of pelf, like worldly elf,
> To toil and moil.
>
> When wife could not, through sickness got,
> More toil abide so nigh sea-side,
> Then thought I best from toil to rest,
> And Ipswich try.

Suffolk has long been distinguished for the excellence of the agricultural machines invented or manufactured there. The modern improvements in agricultural machinery may be said to consist of the following points; and instruments in which they are carried into effect are admirably constructed by the celebrated firms of Ransome, Garrett, and Hurwood:—1. The substitution of steam or horse power for manual; 2. A reduction of the horse or hand power required to work the various machines; 3. The substitution of wrought or cast iron for wood; 4. The introduction of the lever principle; 5. Making a machine serve different purposes at the same time; 6. Making it serve different purposes at different times; 7. Making it portable, and hiring it out as a matter of business. The portion of Messrs Raynbird's work relating to machinery is eminently instructive; and the descriptions are rendered quite intelligible by numerous well-executed wood-engravings.

The collection of local words is peculiarly interesting. It is impossible, however, to read them without being struck with the fact, that a very small proportion of them are strictly local. Many of them are words in general use in English literature; and not a ·:w, which the authors seem to suppose peculiar to Suffolk, are ually well known in the south of Scotland. In fact, the words fined to the county seem to be very few; and the provincialisms ·ably consist more in the modes of pronunciation than in the f peculiar vocables.

ıketch of harvest customs concludes this curious volume; and of these, we must be permitted to say, we should be well 1 to learn had become obsolete. They are "more honoured breach than the observance." Their great object seems to be ert the agricultural labourer into a beer-barrel; a species of

conjuration for which we should be disposed to give him ample credit, without any special festival set apart for the purpose.

*Thomson's Meteorology.**—Most of our readers, we feel assured, will be gratified by the appearance of the volume whose title is given below. Such a work has been long needed; for, with the exception of articles in Encyclopædias, often brief and unsatisfactory, we have no distinct work on the subject of meteorology, and no complete and comprehensive view of the present state of the science. The materials for a treatise of this kind are ample, but they are spread over a very wide surface, and are to be sought for in periodicals and scientific works, for the most part published on the Continent, and from other sources by no means of easy access to the general public. In this wide field the author has laboured most assiduously, and has brought together a mass of useful information, which is judiciously digested and arranged, and presented in such a form as cannot fail to prove interesting and instructive.

This is a subject in which all are more or less interested. The farmer, and every one who has to do with country operations, soon learn to become practical meteorologists; and such a work as the present is eminently calculated to improve their powers of observation, by making them acquainted with the principles to which the appearances they witness ought to be referred. How extensive and useful the field of investigation this subject lays open to the man of science! Yet neither in a practical nor scientific point of view can it be said to have made much progress of late years. A husbandman in the days of Virgil was nearly as well acquainted with the prognostications of the weather as a husbandman of the present day; and although the philosopher may now have accurately ascertained the weight and composition of the atmosphere, the laws of heat and moisture, and may have detected many curious particulars in electrical and other phenomena; yet he must confess, that he is still in ignorance of the great laws by which meteorological changes are regulated, and unable to predict at any one moment what will happen the next. Yet we cannot help thinking that Arago has spoken too decidedly of the future, when he says, that whatever may be the progress of the sciences, *never* will the savant who is conscientious and careful of his reputation, speculate on a prediction of the weather. "The time will come," says Seneca, "when the most profound secrets of nature shall be unveiled, and when posterity shall be astonished that s[illegible] simple explanations of grand phenomena should for so long ha[illegible] been concealed." The most that can be asserted, is that we ha[illegible]

* *Introduction to Meteorology.* By David Purdie Thomson, M.D. Wm. Black[illegible] & Sons. 1849.

not yet penetrated the secrets of meteorology; that we have not hitherto succeeded in tracing the effect to its cause in many atmospheric phenomena. But we are not entitled to affirm that this is a matter which is placed, by the very nature of things, beyond the range of human knowledge. All experience tends to an opposite conclusion. New lights are often, sometimes most unexpectedly, breaking in upon us, our instruments are improving, our powers of refined analysis increased, every day we occupy a higher vantage ground. What more subtile agent in nature than electricity? Can anything be imagined more intangible and elusive? Yet has it, in some respects, been brought completely within the grasp of the philosopher; it has been made our handmaid, and compelled to execute many domestic offices. The same agent that embroils the sky, armed Jove with his terrors, and produces all the "dread magnificence of heaven," has been rendered, by the talismanic wand of science, as innocuous and docile as an infant, introduced into our kitchens and parlours, and set quietly to work in turning our spits and clocks. After this, how shall we set a limit to human discovery even in this difficult field of investigation? Experience may establish a more certain connexion than it has hitherto done between certain signs and subsequent changes; and we may learn from appearances, from which we now infer nothing, to predict with more or less certainty what alterations are about to take place in the atmosphere; the day may come when we may be able to foretell the state of the weather, as certainly as the dervish on the top of the Giant's mountain announces the approach of rain, when he sees a small dark cloud rising over the waters of the Euxine or Propontis. But, as it is, the uncertainty that attends all such matters, has no doubt discouraged many able investigators from giving a practical direction to their inquiries; while it has, at the same time, led not a few ingenious minds to have recourse to the most fanciful theories and wild conjectures to account for the appearances they witnessed. The history of almanacs would form a curious record of human ignorance and presumption. We wish Dr Thomson had devoted a chapter to the subject; it forms part of the history of meteorology, on which he might have been more copious. The celebrated French naturalist, Lamarck, carried these speculations to a greater extent than most others of whom we have heard. For a long period he published almanacs in which the state of the weather throughout the year was most explicitly set forth. The event seldom failed to falsify his predictions; but so far from being discouraged at this, it had merely the effect of making him modify his theory, and start anew with undiminished confidence. Weather prophets are still numerous, and no experience of past failure will put a stop to their vaticinations.

Dr Thomson goes carefully over the whole extent of his subject,

and gives an interesting detail of facts illustrative of it. His object has been rather to present his readers with all that is certainly known, than to indulge in any theories or speculations of his own. The number of anecdotes and narratives which he has inserted illustrative of the different points discussed, renders his work very interesting to the general reader, irrespectively of its more strictly scientific information. He introduces the subject by a brief sketch of the surface of our globe and its motions through space. The composition of the atmosphere, its figure, specific gravity, &c., next engage attention. The following notices refer to the sufferings of travellers from rarefied air :—

The brothers Gerard, in their travels among the Himmalehs, frequently felt the inconvenience of atmospheric rarity. One of them thus describes his feelings:—"Our elevation was now upwards of 15,000 feet, although we had ascended in company with the river against its current. Here only began our toils, and we scaled the slope of the mountain slowly ; respiration was laborious, and we felt exhausted at every step. The crest of the pass was not visible, and we saw no limits to our exertions. The road inclined at an angle of 30°, and passed under vast ledges of limestone. The projections frowned above us in new and horrid forms, and our situation was different from anything we had experienced. Long before we got up, we were troubled with severe headaches, and our respiration became so hurried and oppressive, that we were compelled to sit down every few yards; and even then we could scarcely inhale a sufficient supply of air. The least motion was accompanied with extreme debility, and a depression of spirits ; and thus we laboured for two miles." Lieutenant Wood, at Pamer in Central Asia—the Bam-i-duniah, or roof of the world, (N. lat. 37° 27′, E. long. 73° 40′) perhaps the most lofty *plateau* on the globe—endeavouring to break the ice on the lake of Sirikol, to measure its depth, found a few strokes with the axe exhausted the men, and continued work was impracticable. Mr Green and Mr Rush, who ascended in a balloon in September 1838, to the height of 27,136 feet, or 5¼ miles above the sea—the greatest altitude, we believe, yet attained—felt comparatively little inconvenience, though the first 11,000 feet were ascended in 7 minutes. This arose evidently from the almost absolute repose of the body. Mr Rush suffered only from the cold, and Mr Green felt his respiration hurried only when he exerted himself. Captain Batten says the feelings experienced by him on the Nittee Pass were far more severe than *angina pectoris*.—p. 19.

The following suggestions for safety during a thunder-storm, it may be useful to remember :—

Sedulously avoid all conductors of electricity. Do not shelter under trees, nor come near them ; the great majority of accidents arise from want of this precaution. Do not handle or be very close to metallic bodies—a servant cleaning a silver fork at a window during a thunderstorm, the prongs being outward, was struck, but not killed ; a young lady, during the same storm, sewing near a window, was thrown from her seat and experienced a glow. The centre of the room, if a metallic lustre is not pendant, is safer than any other part of the apartment. It is not safe to be between the window and door or fireplace, where there is a current of air. A bed is the securest retreat ; so all ye who fear, and fail to derive pleasure mingled with awe, in beholding this, the grandest of nature's meteors, ensconce yourselves within the woollen folds, and, sunk in your downy couch, if ye cannot fall into gentle slumbers, think at least that you enjoy comparative safety ! M. Arago recommends that the bed should be suspended by silken cords, and instances the case of a female servant who was killed by lightning on September 27, 1819, at Confolens, Charente, while in bed ; a gentleman asleep in bed at Harrowgate, was killed by lightning on September 29, 1772, while his wife reposing by his side was not awakened. An open field is a place of little danger ; if the clothes are wet, the additional safety is a sufficient recommendation, but observe, do not let them dry upon your body. Every-

thing considered, it is safer to be in-doors than out, during a thunder-storm; females and children, from statistical tables, enjoy greater impunity than males. The danger is much increased by proximity to the storm.—p. 292.

Dr Thomson concludes his highly interesting and useful work with the following remarks:—

In drawing to a close this feeble attempt to raise upon a multitude of facts, a science connected by generalities, the author would observe that there is much yet to be done. The meteorology of the present epoch is very different from that of Aristotle and his pupil Theophrastus, or even that of the early years of the present century. The unwearied labours of a goodly host distributed over the globe, watching every cosmical phenomenon, and recording at stated times their observations, have been already amply rewarded; and we look forward with no small expectation to "coming events" which, in the discoveries of Faraday, may be said to have "cast their shadows before." The various meteors described are not the offspring of separate causations, but functions of common principles. The intimate connexion and agency of heat and electricity is apparent in the *tout ensemble* of the science. The former is the *primum mobile* of meteorology, and oxygen, nitrogen, and hydrogen, the elements with which it operates.

Botanical Landscape-gardening. By Mr DAVID GORRIE, Annat Cottage, Perthshire.—In the history of British landscape-gardening, from the time when the close of the civil wars between the houses of York and Lancaster favoured the development of peaceful arts, to the commencement of the present century, few traces can be found of the influence which botanical science is fitted to have on the arrangement of the landscape-gardener's materials. The royal gardens of Nonsuch, laid out in the time of Henry VIII., "contained only two or three species of shrubs and fruit trees." In the Dutch style, which was displayed in the days of King William, geometrical forms were more attended to than botanical variety; and in the labyrinths and shorn trees and hedges which had been fashionable for some time previous to the expulsion of the Stuarts, botany met with still fewer marks of regard. "Knots and mazes," when "cunningly handled," were considered as the chief agents in the beautifying of gardens. Rare plants, when introduced, were regarded more as curious than as scenic objects. In the time of Queen Anne, vegetable sculpture fell into disrepute, and wild scenery was introduced into gardens for the sake of novelty and contrast; but indigenous trees and shrubs were alone consistent with the avowed character of such episodical landscapes. In the various phases which, in the progress of its development, the modern style assumed, the botanical characters of trees and shrubs met with but a limited share of attention. The classical gardens of Kent, the smooth lawns and circular clumps of Brown, the beautiful drawings of Repton, and the pleasingly picturesque scenery of Knight and Price, were all called into existence with little reference to the researches of such eminent naturalists as Tournefort and Linnæus. The promulgation of the natural system of botany,—the newest system, and yet the oldest, for its rudiments are contained in the first chapter of the oldest book in existence,—prepared the way

for the introduction of a new era in landscape-gardening; and that era may date from the time of John Claudius Loudon, and more especially from the publication of his *Hortus Britannicus*, and *Arboretum et Fruticetum Britannicum*. This last magnificent work supplied a want that had become more and more felt as botanical science made progress; it constituted a guide to that knowledge of trees and shrubs which the landscape-gardener now finds it necessary to possess.

Landscape-gardening may be practised without any direct reference to the science of botany. In one sense it is entirely independent of this science. It has too much connexion with the ethereal, the poetical, and the spiritual, to be under subordination to the rules of any earthly science whatever. It aims at gratifying that love of beauty and that perception of sublimity which are natural to the soul of man. And the soul may be impressed with the presence of the sublime when the object contemplated is a wild rugged scene in which native trees alone appear, far more readily than if trees known to be brought by the hand of man from foreign climes, were to show themselves as component parts of the landscape. So, also, the beauty of native objects is most appreciated by that soul which seeks for beauty alone. Such objects speak not of the intruding hand of art. They excite not ideas connected with materialism. They are loved because of their own inherent beauty,—

> How sweetly blooms the gay green birk,
> How rich the hawthorn's blossom!

Was such language ever applied in any country to exotic or unnaturalised trees, however beautiful these might be? The ravishment of soul that results from the contemplation of the gorgeous, the beautiful, or the sublime, is all the more readily experienced when the objects in which these qualities are supposed to reside are natural and free from constraint. The lovely hawthorn-den is fitted to afford more *real*, unalloyed gratification than a group of hawthorns, consisting of numerous species and varieties, native and foreign, such as may be found in the arboretum or botanic garden. But, in a garden of any kind, art must be avowed; and it is not meant, by these remarks, that exotic trees and shrubs are valueless to the landscape-gardener. Far from it; they are of much value. All that is intended is, to remind the reader that the art of ornamenting grounds has, as an art, an independent existence; and to defend the landscape-gardeners of the last century from the attack made upon their principles and practice by some modern writers, who complain that they paid little or no attention to the introduction of rare shrubs and trees into scenery. Let the partial excuse made for them, to the effect that such standard works as the *Arboretum Britannicum* were not in their days available, be laid

aside, and let it be acknowledged that, in many instances, they were impelled by a true appreciation of the nature, requirements, and aim of their profession. They sought to give existence to the beautiful, the attractive, and the lovely; and, pretending not to be botanists, they acted independently of phytological science. Had they acted otherwise, they might have lost sight of those first principles of their art which it was their design to elucidate; and landscape-gardening might still have been, what they found it, a thing of fancy and caprice. Well was it for the art that, by the mental labours of Repton, Shenstone, Gilpin, Knight, Price, and others, a considerable amount of light was cast on its elemental principles, ere the botanists of modern times put forward their claims. Well was it that the picturesque style was established ere the *gardenesque* was introduced!

The term *exotic*, as used by botanists, is synonymous with the word *foreign*, as opposed to indigenous. But for the landscape-gardener, it is most convenient to class trees and shrubs into two divisions, differing in their limits from those indicated by the words indigenous and exotic. One division may include all native ligneous plants, and all that have been so naturalised as to be looked upon as natives by the every-day observer. The other is composed of those species, which, from their rarity, or their existing only in a cultivated state, are evidently foreigners. The botanist deals with facts, and the ornamental planter with mental associations.

As art was avowed in the geometrical or ancient style, by means of straight lines, and lines forming segments of circles, and also by the formal arrangement of trees and by vegetable sculpture, so there is an avowal of the same agency in the picturesque style, when foreign trees and shrubs are introduced amongst its materials. They speak of the collecting and disposing hand of man, and serve, along with the smoothness of lawns, and the appearance of fences and gravelled walks, to indicate that the landscape in which they form objects, has been set apart for human use and enjoyment. In the wild scenery of nature, they would form incongruous intruders. The landscape-gardener, equally with the botanist, is set against the deceptive practice of placing rare exotics in situations which might appear to those unacquainted with plants, to be their natural *habitats*. In the mind of the one, the love of order and congruity is as strong as is the love of science in the mind of the other. It is the presence of exotic trees in an ornamental garden, laid out in the natural or picturesque style, that raises modern landscape-gardening to a rank amongst the fine arts, or that at least helps to do so. Were nature taken for the planter's model, and were he to employ only well-known native trees, his work would at once appear to be a slavish imitation, and would fail to please in the same manner as a statue would do if deceptively painted so as to

resemble a living man. But where art is avowed, by the introduction of plants that have been brought from other climes, the effect is pleasing—no deception is practised; and the polished landscape ranks along with the sculptured (but not painted) marble, both being the production of arts that claim to be termed *fine.* Imitations of nature have doubtless sometimes been introduced with good effect as contrasts to polished scenery; but their effect is not lasting, for mimicry of every kind can only please partially, and will not bear close or repeated observation. This imitative style is the lowest kind of landscape-gardening—if, indeed, it deserves the name; and this none the less, although the beauties of real nature, as stated before, are far superior to those of art. Being judged by two different standards, the two kinds of beauty are both fitted to excite enjoyment; and as a means of keeping them separate and entire, art should neither interfere with, nor seek to mimic, the beauties of nature; while again, art should be boldly avowed in gardens, for these are consecrated to the use of man. Botany enables the more modern designer of picturesque garden scenery to indicate the presence of art with much readiness, even although he may adhere greatly to a ruggedly natural style of grouping; but he is none the less indebted to his predecessors, who, dealing with lines, forms, colours, and masses chiefly, sought to fix the principles of landscape-gardening, considered as an art more connected with the rules of beauty and harmony, as understood by the painter, than with the treasures of the botanic garden and the nursery.

It is, at the present time, of importance that the mode in which collections of rare trees and shrubs may be best introduced into picturesque garden-scenery, should be well defined and understood. The botanist has, in some respects, interfered too far with the duties of the landscape-gardener. In the arrangement of avowed *arboretums* the botanist may act as he pleases; but when he introduces what may be termed the arboretum style partially into ordinary park-scenery, he runs the risk of attempting to amalgamate materials, which, from their nature, are uncombinable. Fine trees may not of themselves adorn a park; and let them be ever so fine, they require to be arranged according to the principles of symmetry, order, and congruity, just as well as trees of the commoner kinds. A few examples may serve for illustration; and in these examples, certain acknowledged axioms, selected from the writings of landscape-gardeners, will be expressed, as affording sure ground-work from which to seek and arrive at conclusions:—

"The painter," says Repton, "sees things as *they are*—the landscape gardener as *they will be.* Indeed, I have frequently observed, that, in planting a tree, few persons consider the future growth or shape of different kinds." Where trees are botanically arranged,

little or no attention can be paid to the effect of their future growth or shape on scenery.

"The lines of gothic buildings are contrasted with round-headed trees, and those of the Grecian will accord either with round or conic trees; but, if the base be hid, the contrast of the latter will be most pleasing."—(Repton.) Such considerations are of high importance to the designer, but have been much lost sight of since it became fashionable to judge of trees chiefly by their rareness or novelty. The principles of the art might sometimes require the unsparing sacrifice of fine and costly specimens of such trees as *Cedrus Deodara* and *Cryptomeria Japonica;* and the lover of true scenic beauty would not hesitate to condemn even these highly valued trees wherever they appear as intruders.

"One great mischief of an avenue is, that it divides a park, and cuts it into separate parts, destroying that unity of lawn or wood which is necessary to please in every composition." (Ibid.) Collections of ligneous plants botanically and geometrically arranged along the sides of an approach or a walk, may, under certain circumstances, be liable to a similar objection.

"Nature flies from frequented places; it is on the summit of mountains, in the depths of forests, and in desert islands, that she displays her most affecting charms; those who love her, and who cannot go so far in search of her, are reduced to the necessity of restraining her, and forcing her to take up her habitation among them; but this cannot be done without a certain degree of illusion." (Rousseau.) In so far as the imitation of nature by art descends not to childish mimicry, it is allowable, and may be highly pleasing; but the effects of such imitation may be sadly marred where botanical collections interfere; and these require therefore to be kept by themselves,—in scenery of their own. Arboretums are arranged in either of three different ways,—the phytological, which has reference to the scientific classification of plants agreeably to the natural system; the geological, which requires irregularity of soil and surface; and the geographical, which brings together the plants peculiar to certain zones or territories of the earth. An arboretum arranged in any one of these modes, ought to be placed in a secluded situation, separated from other kinds of scenery, so that unity of expression may be maintained. In picturesque park-scenery neither of these modes of planting can be adopted; and while exotic trees may prevail largely in such scenery, calling up to some extent associations connected with the beauties of nature in different countries, they require to be arranged by the man of taste rather than by the man of science. So arranged, they may fulfil what Quatremere de Quincy has defined the end of imitation to be, namely, to present to the senses and the mind, through the intervention of the fine arts, images which, in all the different forms of imitation, shall furnish an aggregate

of perfection and ideal beauty to which particular models afford no equal.

"The most elevated kind of beauty in landscapes, of whatever description, is undoubtedly that of *expression;* and the highest imitative effects of the art, therefore, consist in arranging the materials, so as to create emotions of grace, elegance, picturesqueness, or grandeur, joined with unity, harmony, and variety, more distinct and more forcible than are suggested by natural scenery, producing, by this means, intellectual gratification, separate and distinct from that arising from the mere admiration of forms or materials employed." (Downing.) Scenery ought to be expressive of some peculiar kind of beauty, whatever that kind may be. After a favourable general expression has been insured, the beauties of individual objects may come in for their due share of regard. While the *gardenesque* style provides for the free development and perfect growth of each individual tree, it also acknowledges the necessity of creating a general grouping and unity of expression. It is only by conforming in some measure to the rules of the picturesque, that the gardenesque becomes suitable for the ordinary lawn or park. Refusing thus to conform itself to established principles, it becomes suitable only for the botanic garden or scientific arboretum.

"When a wood in a garden has bold and expressive outlines; when light and shade are picturesquely distributed over it; when the forms of the foreground, and also that of the background, are beautiful, and clearly and distinctly separated from each other; when the foreign and native trees are mixed together in proud masses, and harmoniously grouped; when novelty of form and colour are everywhere apparent, and not to be seen in the natural landscape, then the art of gardening triumphs." (Sckell.) By the use of foreign trees in this way, but not by their scientific arrangement, a garden becomes artistical while formed on nature's model, and the treasures of other climes lend their aid in enriching and beautifying the scene.

"Variety, of which the true end is to relieve the eye, not to perplex it, does not consist in the diversity of separate objects, but in the diversity of their effects when combined together, in a difference of composition and character." (Price.) It is therefore in vain to seek variety by collecting a numerous array of different kinds of trees into one piece of scenery. Here may indeed be variety in such a scene in the estimation of the botanist, but not in that of one who seeks for gratification in the contemplation of the general landscape. A few kinds of trees, arranged in masses, each by itself, yet combining with the rest, may be productive of true variety of character; which, as the same author observes, cannot exist without a certain distinctness, without certain marked tures on which the eye can dwell. Mixture leads to sameness

rather than to diversity. It is possible that in the most complete arboretum there might be much scenic monotony, except in such situations as contained large groups of trees, similar in shape and foliage, and belonging to the same natural order.

"When adjacent groups of trees are very dissimilar, such as when the pine and fir tribe adjoin deciduous trees, the union must be very gradual, by means of numerous indentations and ramifications of the one group into the other." (Loudon.) Attention to this precludes those exact boundary lines which botanical groups require; and the consequence is, that a correctly arranged arboretum cannot form a part of artistic scenery.

These constitute some of the reasons why scientific arboretums should form episodes in landscapes, rather than mingle with the general scenery; and why rare trees, when introduced into ordinary park-scenery, should be made to conform themselves to their situation, without claiming peculiar exemption from the acknowledged rules and principles of landscape-gardening, because of their individual beauty, rarity, or value. More than one danger attends the introduction of rare trees into the landscape-garden; for not only are they apt to divert the attention from the general expression of the scenery, but also tend to mar its effect when they grow up, for this simple reason, that those who planted them were necessarily ignorant of their habits and rapidity or slowness of growth, and their fitness or unsuitableness for the climate in which they had been placed. This refers to recently introduced exotics, and illustrates the necessity which the modern landscape-gardener is laid under, of studying not only botany, but also the principles of horticulture and arboriculture.

In portions of ground set apart for scientifically arranged collections of trees, a style of landscape entirely different from every other style must prevail. The arboretum style partakes of the gardenesque, inasmuch as the trees stand singly, or at such distances as to be able to assume their natural shapes; but differs also from the gardenesque, in so far as that style is guided by the acknowledged rules of the picturesque and natural. It partakes of the picturesque, to some slight extent, when its groupings are varied and irregular; and of the geometrical, when its families of trees are planted in circles, larger or smaller as occasion requires, or when they are arrayed in lines by the sides of roads or walks. The geometrical style, however, cannot be satisfactorily displayed in an arboretum,—for, although the trees may be planted in formal squares or circles, they must still be allowed to grow as they please, with little interference on the part of the pruning-knife, and none on that of the shears; and if they be planted in rows, the effect cannot be satisfactory, in so far as the geometrical style is concerned,—for that style must not only have rows and avenues, but the individual trees of which these consist must be (unlike the

trees of an arboretum) of similar age, size, and habit of growth. But, if the arboretum has no fixed style, it is sufficient to make up for this, that style is therein a very secondary consideration, the individual objects claiming a chief share of the attention, and furnishing in themselves sufficiency of attraction to the spectator. And there certainly is, in an arboretum, much to excite feelings of interest and delight, and that at all seasons of the year. It is not so with a *herbacetum*, for there are some natural orders whose flowers bloom almost all in the same season, and consequently, the beds set apart for these orders in a botanical collection of herbaceous plants, must, at the other periods of the year, be wanting in interest. Some of the beds containing endogens, for instance, may be gorgeously arrayed with the crocus, the vernal squill, the grape-hyacinth, and the narcissus, in spring and early summer, while in autumn not even a leaf is to be seen, and the surface of the beds presents large patches of bare earth. But, in an arboretum, change consists more in progression than in evanescence, and the humblest group which it contains is interesting, from the hour of its formation onwards. In winter, the evergreens are pre-eminent in beauty; and the spray and buds of deciduous trees appear in endless variety. In spring, the unfolding of leaves, and opening of blossom-buds, delight the eye of every beholder. The gay flowering season passes away, only to be succeeded by the living green of summer. The rich and varied tints of decaying foliage in autumn, give rise to mournful yet pleasing associations, —mournful, because, like Ossian's "tree with scarce a leaf, and long grass that whistles in the wind," they speak of change and death,—pleasing, because, from their brightness, they inspire feelings of hope and anticipations of a coming glorious spring. Considered as a place of resort for all seasons, the arboretum is far superior to the botanical herbacetum, and in some respects better than the flower-garden, although this last may be kept gay for at least nine months out of the twelve.

The botanical mode of arranging trees in an arboretum is better adapted to please and instruct than either the geographical or the geological. These last must always be deficient in at least one respect; for, allowing variety of soil and situation to be at the will of the planter, still climate cannot be controlled. In public arboretums of limited extent, there is less room for giving the different groups irregular and picturesque shapes, than in private collections, such as that at Chatsworth, where the trees are grouped on either side of a lengthened winding walk. In small suburban gardens, it has been successfully attempted to cultivate numerous kinds of trees, by only admitting one of each species; but in these gardens a correct botanical arrangement cannot well be adopted, and is indeed not altogether desirable. As a general rule, it is not commendable to plant limited suburban gardens in this manner;

only, exceptions may be made in cases where the possessors of these gardens are zealous botanists. Where beauty is preferred to science, the aim of the designer may be arrived at by confining the selection to a few of the most ornamental kinds of trees. It would add much to the interest, and would not detract from the beauty of a row of suburban gardens, were each enclosure to have its trees and shrubs selected chiefly from one natural order, and that order to differ from those represented in the other gardens of the row. Thus, hawthorns, pears, cherries, and quinces, might prevail in one; honeysuckles, elders, laurustinuses, and snow-berries, in another; arbutuses, rhododendrons, and kalmias, in a third; the privet, the lilac, and the ash, in a fourth; the elm, the walnut, and the carya, in a fifth; the oak, the beech, and the chest-nut, in a sixth; the broom, the laburnum, and the robinia, in a seventh; and the cedar, pine, and araucaria, in an eighth. One natural order might prevail in each garden, though not exclusively. The effect would not be injurious to the general effect, because, in such situations, unity of expression is not looked for, and never found.

The subject sought to be illustrated in the above remarks, is not altogether destitute of importance. Many of the trees planted in botanical collections, whether these be limited to one group, such as the coniferous, or form complete representative systems of trees in general, are not only rare, but expensive. It is certainly worth while, before planting such collections near a residence, or in any prominent part of a landscape, to inquire whether the trees, when they grow up, may not be expected to injure the amenity of the scenery. In dealing with common trees that stand in his way, the improver of scenery may call the axe into use; but trees planted for the sake of their rarity and botanical interest will, it is likely, be held sacred from such interference. Where arboretums are to be formed in private grounds, a safe rule will be, to fix their site in some secluded corner, and to separate them from the rest of the scenery, that they may not interfere with its unity of style and expression. This is exemplified in the extensive arboretum at Prestonhall, which is not seen in the principal views of the place.

The Russian or Winter Bean has been grown in high perfection around Croydon for several seasons. It is thus described in Mr DAVIS'S *Farming Essays*, No. xiv. p. 64-5:—

Its capability to stand our winter in the south of England, when sown in September and October, I have fully tested, having grown it every year the last sixteen or seventeen years, and never seen it hurt by frost, except upon springy ground, or when sown later in the winter. I think it a most valuable introduction on loamy soils. The advantages from growing it are,—it does well on soils unsuited to spring beans; affords a valuable alterative crop, with a good seed-bed for turnips to be sown among the beans; it harvests early—some years in July; admirably, and at little cost, enables the land to be well prepared for wheat; and, when well sown, that is

to say, drilled wide, and kept clean by the frequent use of the scarifier and hand-hoe, admits of foul land being cleaned at little cost, and without the loss of a crop of corn. I have frequently had as fine crops of turnips that were sown among beans, without manure, and at a cost of only seven or eight shillings per acre, as are generally seen from high manuring, and after fallow.

The success of turnips in the intervals between the beans, standing in rows 28 inches apart, must depend upon the summer. In 1847, I observed the progress of the two crops—not a bean was injured during the extremity of drought here. The common bean suffered dreadfully on all the farms—ravaged and destroyed by the black aphis—while the *Russian* stood unscathed, and bore profusely, though somewhat dwarfed; but the *turnips* could not advance, as no rain of any moment gave them assistance in brairding, and during the early weeks of growth. Hence, when the beans were harvested, and the ground horse-hoed, the turnips failed for want of water. A fine plant of wheat, however, afterwards occupied the several turnip-fields.

Mr Davis proceeds, by example, to prove his assertions. He adds, that—

On Sept. 20, 1846, 600 sheep were put upon turnips thus raised, which lasted them six weeks, and yet were grown upon ground that had yielded four or five quarters of beans per acre, or more; and one of the fields previously was an old sainfoin lea that had lain waste many years, was full of weed, and in every respect appeared unsuited to the growth of corn. This bean, by its early flowering and setting of the bloom, has never yet, with me, suffered from the dolphin, or indeed from spring drought, of which the crop of 1847 is a remarkable instance, for all my fields have produced fine crops without exception, and yet spring-sown beans have almost everywhere failed.

I fancy that the introduction of beans into the rotation for light soils may be a means of ridding land of the wire-worm. This insect is produced and nourished by the cereal grasses, and cannot long exist among legumes cultivated in the way I recommend.

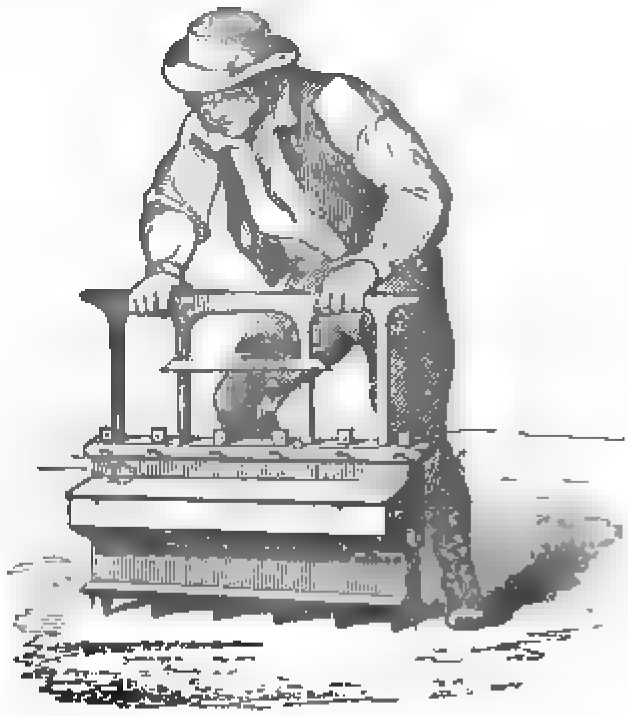
Land lying waste.—Next in importance to the thorough preparation of the ground, is the redemption of waste portions throughout the kingdom. It is fearful to contemplate the enormous quantity of broad land that might be called in requisition, and cultivated with the best advantage for the rapidly increasing population. Assuming that there are now 15,000,000 of waste acres, according to the calculation of some authorities, and, to come nearer home, that the county of Surrey alone represents 60,000 of those acres, what a store of food might be raised thereon by the labour of the poor whom hunger stares in the face, and "who have no refuge!" Talk of distress as a cause of discontent, and of the misery which hardens the sufferer, and impels him to rebellious deeds of violence and aggression! Does not common reason at once suggest that the remedy is at hand—that labour, healthful, peace-conferring labour, is mighty, all-subduing, and can, if wisely directed, overcome every difficulty? In Surrey we have evidence to furnish a satisfactory instance, and within two miles of my abode.

At the foot of the Addington Hills, there are little plots of black heath soil, abounding with rounded pebbles, and resting upon a wretched gravel, which, by the labour of small cottagers, are now productive of fine and luxuriant vegetables. There are also whole estates of many hundred acres, resting, by nature, upon a pan of concrete gravel, the soil so poor as to be apparently worthless, that, by judicious, untiring labour, yield wheat, barley, oats, in crops far exceeding the average from fine loam, with intermediate returns of beans, cabbage, turnips, kohl-rabi, correspondingly heavy.

It is with great pleasure I perceive that an impression has been produced upon landlords and tenants, by the frequent appeals that have been made in agricultural publications and lectures, on the subject of waste land. Within short distances we find large wild hedges, plots of useless underwoods, and timber grubbed, the soil cleared of roots and thrown into cultivation; thus enlarging the expanse of fields, and improving their figure. The railway waste pieces have in many instances been deeply dug, preparatory to planting chiefly with potatoes. But still, not a tithe part has been touched; and we see broad strips of land adjoining the arable, and by the sides of roads, occupied by brambles, and every species of local weeds. The circumstance calls for reproof and admonition, since it, and all its concomitants, are a reproach to the parties concerned. Our agriculture will never attain excellence till all useless, or rather destructive, timber shall be destroyed, and the fields laid out in large ten or twenty acre squares or oblongs, fenced, wherever possible, with neat, compact holly hedges, open to the full sun, and the access of pure atmospheric air. Not only would crops be vastly increased, but the health and comfort of the population be abundantly improved.

The blessings of plenty, peace, quietude, and contentment, being more widely diffused, the minds of the labouring classes would, in proportion, be diverted from those causes of discontent which it is the abominable object of designing men to aggravate and misrepresent, for the worst and most selfish of purposes. "The hand of the diligent shall bear rule," and "He that gathereth by labour shall increase," are truths, as solemn and assured as is the denunciation that "The idle soul shall suffer hunger." We have land in abundance of the highest capability, and a climate which, though changeable, is upon the whole most benign and propitious. Reforms, true in principle and practice, are doubtless required in every department and branch of society; but in none, and in nothing are they more imperatively called for than in the distribution of labour in the culture of the ground. The subject is of vital importance, and I offer the foregoing general suggestions to the consideration of the wise and influential.

Newington's Dibble.—Dr Newington has kindly given us one of his dibbles, which sows six rows of grain; and this machine is the more acceptable, as we believe it to be the identical one which obtained the premium at the Show of the Royal Agricultural Society of England at Norwich last July. It is represented in the annexed cut. We purpose letting as many of our agricultural friends have a trial of the machine, during the course of this autumn and of next spring, as choose to do so; and we shall intimate the results in due time. Printed directions for its use are pasted on the inside of the seed-box, so that no one can go wrong in its use; and as far as we could make trial of a deposition of seed by it, under unfavourable circumstances, it deposited them very well.



AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
June 2.	45 10	30	18 2	24	29 10	30 2
9.	46 3	23 6	20	25	29 10	29 4
16.	45 9	25 10	18 8	24	30 3	28 4
23.	46 4	26 7	19 11	24 2	30 0	29 4
30.	45 11	25 10	19 5	24 9	32 3	30 7
July 7.	50 4	25	19 7	25 2	34 3	30 5
14.	46 11	28 2	21	24 7	29 8	31
21	52 3	22 6	21 6	25	29 2	31 11
28.	50	25 2	19 10	24 8	29	33 1
Aug. 4.	51 3	26 1	21 11	25	31	30 10
11.	50	26	20 7	24 8	33	29 8
18.	48 10	24	24 1	24	29 7	28 4
25.	46 2	32	19 6	26	29 5	30 7

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.
June 5.	48 6	26 5	21 4	30	30 9
12.	49	23 3	21 2	30 6	31 1
19.	49 2	25 6	20 7	31 1	32 2
26.	49 11	26 2	21 2	31 4	31 10
July 4.	50 1	28 1	21 5	31 6	32 1
11.	51 2	29 3	22 2	32 2	33 6
18.	51 10	29 8	23 1	32 5	33 1
25.	49 11	29 3	21 9	32	32 5
Aug. 1	50 11	27 9	21 3	32 4	32 11
8.	48 3	27 8	21 4	33 1	34
15.	48 1	26 9	21	32	32 4
22.	48 8	26 3	21 2	32 8	33 3
29.	49 5	26 9	21	31 1	31 10

LIVERPOOL.

Date.	Wheat.	Barley	Oats.	Rye.	Pease	Beans.
1849.	s. d	s. d.	s. d.	s. d.	s. d	s. d.
June 2.	46 4	28 8	20	24 4	29 6	30 10
9.	44 4	27 4	18 9	24 8	29 10	30 8
16.	44 11	26 5	21 2	25 1	30 4	29 8
23.	45 3	25 9	21 9	24 9	30 9	31 10
30.	45 8	25 2	18 5	25 2	31 4	36 6
July 7.	51 10	26 2	19 7	25 8	31 0	30
14.	47 11	25 10	19 9	24 9	33 3	30
21	45 6	24 4	18 8	25	32 6	32
28.	45 8	24 2	19 11	24 8	31 5	32 5
Aug. 4.	46 9	23 6	21 8	24 2	30 10	32 10
11.	46 1	21 7	18 10	24 10	30 2	31 2
18.	47 6	22 8	19 1	25 6	29 8	30 8
25.	45 8	23 2	18 10	25 10	29 2	33 4

DUBLIN

Date.	Wheat, p. barl. 20 st.	Barley, p. barl. 16 st.	Bere, p. barl. 17 st.	Oats, p. barl. 14 st	Flour, p. barl. 9 st.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.
June 1.	23 10	14 4	12 6	13 1	14 9
8.	23 11	14 6	12 4	12 9	14 7
15	23 2	14 8	12 2	12 8	14 6
22.	22 4	14 4	11 10	12 10	14 7
29.	21 7	14 10	12 4	13	14 8
July 6.	23 3	15	13 2	13 3	16 3
13.	23 6	15 1	13 3	13 4	15
20.	25	14 8	12 10	13 3	15 6
27	24 9	14 0	12 6	13 10	16 8
Aug. 3.	25	14 8	12 18	13 1	15 9
10.	25 3	14 5	13	13 3	16 1
17.	25	14 4	13 1	13 1	15 9
24.	23	13 10	12 2	13 3	16

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average.	Wheat. Aggregate Average.	Barley. Weekly Average.	Barley. Aggregate Average.	Oats. Weekly Average.	Oats. Aggregate Average.	Rye. Weekly Average.	Rye. Aggregate Average.	Pease. Weekly Average.	Pease. Aggregate Average.	Beans. Weekly Average.	Beans. Aggregate Average.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d	s. d.	s. d.
June 2. ...	44 9	45 4	27 10	28 5	17 7	17 6	26 0	25 10	33 4	31 1	31 7	30 3
9. ..	44 6	45 1	26 11	28 1	17 6	17 7	25 4	25 0	30 4	31 2	31 6	30 8
16. .	44 2	44 8	26 5	27 8	18	17 8	26 3	25 8	30 5	31 3	30 3	30 9
23. .	44 6	44 6	20 6	27 3	18 9	17 11	25 9	25 11	31 5	31 4	30 10	31
30. ...	45 4	44 8	25 6	26 10	17 11	17 10	27 9	26 3	31 5	31 6	31 9	31 2
July 7. ...	47 1	45 1	25 11	26 6	17 10	18	28 1	26 7	33 10	31 9	32 1	31 4
14.	48 2	45 8	25 3	26 1	18 9	18 2	26 11	26 8	30 9	31 4	32 2	31 5
21. ...	48 10	46 4	26 7	26	19 4	18 5	28 6	27 2	32 4	31 8	32 1	31 6
28. ..	49 1	47 2	26 1	26	19 6	18 8	26 1	27 1	32	32	32 6	31 10
Aug. 4. ...	48	47 9	26 3	25 11	19 4	18 10	25 6	26 2	32 1	32 1	31 10	32
11. ..	47 4	48 1	25 3	25 10	19 2	19	26 7	26 11	31 1	32	32	32 1
18. ..	46 3	46 11	26 1	26	19	19 2	27 5	26 10	29 2	31 3	31 9	32
25. ..	44 8	47 4	26 4	26 2	18 10	19 3	26 5	26 9	28 8	30 11	32 2	32 1

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat	Barley.	Oats.	Rye.	Pease.	Beans.
1849.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June	Danzig	36 6 - 41 0	14 6 - 20 0	9 0 - 13 0	15 0 - 19 0	20 0 - 25 0	19 6 - 23 6
July .	Danzig	38 6 - 46 0	15 0 - 21 0	10 0 - 14 6	16 0 21 6	19 0 - 24 0	20 6 - 25 0
August	Danzig	38 0 - 44 0	15 6 - 22 0	10 6 - 15 0	16 0 - 20 0	20 0 - 25 0	20 0 - 25 0
June	Hamburg	36 0 - 39 6	15 6 - 20 0	10 6 - 13 6	15 6 - 20 0	18 0 - 22 6	20 0 - 25 0
July . .	Hamburg	40 0 - 44 0	17 0 - 24 0	12 0 - 15 0	16 6 - 21 0	19 6 - 24 0	20 6 - 26 0
August	Hamburg	38 0 - 42 0	17 0 - 23 0	11 0 - 14 6	16 0 - 20 0	18 6 - 23 0	22 0 - 26 0
June .	Bremen	37 6 - 43 0	14 6 - 19 0	9 6 - 13 6	16 6 - 20 0	19 0 - 23 6	22 6 - 26 0
July . .	Bremen	38 6 - 44 6	15 6 - 21 0	11 6 - 15 0	17 6 - 21 6	19 6 - 24 6	23 0 - 26 6
August	Bremen	37 0 - 42 6	15 6 - 19 6	10 0 - 14 6	16 6 - 20 6	20 0 - 25 0	21 6 - 25 6
June . .	Königsberg	34 0 - 40 0	12 6 - 16 0	9 0 - 11 0	15 0 - 19 6	16 0 - 21 0	19 0 - 24 6
July . .	Königsberg	36 0 - 42 0	14 6 - 19 0	10 6 - 13 6	16 6 - 20 0	18 0 - 22 6	20 0 - 20 6
August	Königsberg	38 6 - 45 0	14 0 - 18 6	11 0 - 14 0	17 0 - 21 0	19 0 - 24 0	20 0 - 26 0

Freights from the Baltic from 3s. 3d. to 4s. 6d., and from the Mediterranean, from 6s. 6d. to 7s. 6d.

THE REVENUE. From 5th July 1848 to 5th July 1849.

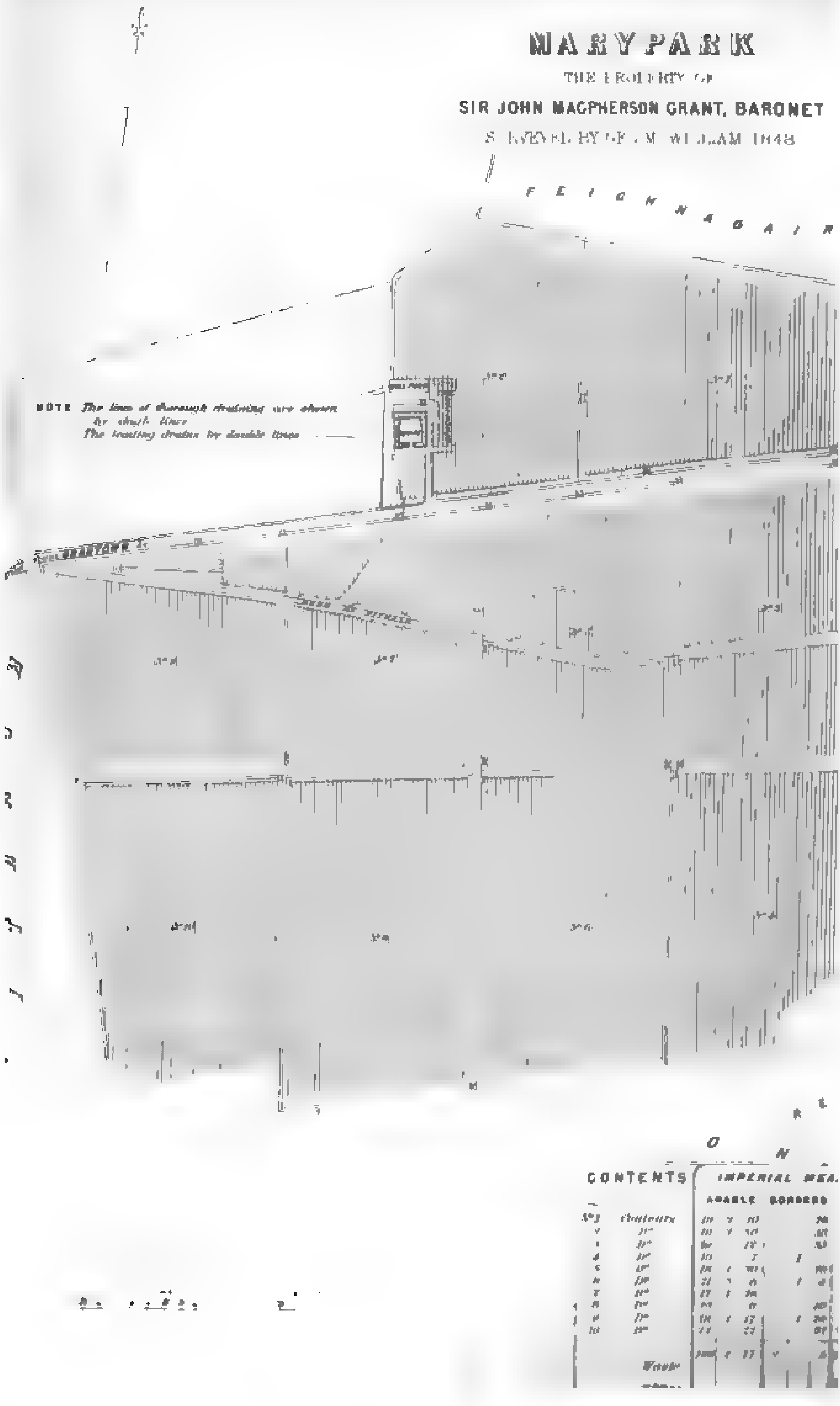
	Quarters ending July 5.		Increase.	Decrease.	Years ending July 5.		Increase.	Decrease.
	1848.	1849.			1848.	1849.		
	£	£	£	£	£	£	£	£
Customs . . .	4,447,832	4,128,777		319,055	17,888,988	18,810,774	921,786	.
Excise.	3,473,809	3,020,602	.	453,201	12,263,233	12,196,013		68,320
Stamps . . .	1,557,640	1,619,607	62,057	. .	6,449,108	6,103,408	.	345,700
Taxes .	2,034,133	2,054,720	20,507	. .	4,306,703	4,330,500	32,707	. .
Post-Office . .	136,000	196,000	60,000	. .	787,000	849,000	62,000	. .
Miscellaneous	19,227	110,140	90,913		221,406	334,564	113,158	.
Property Tax	988,401	1,033,240	44,839	. .	5,411,253	5,362,083		49,170
	12,657,042	12,163,086	278,316	772,256	47,327,691	47,986,342	1,129,651	463,190
		Deduct Increase . .		278,316	Deduct Decrease		463,190	
		Decrease on the qr. . .		493,940	Increase on the year		666,461	

TABLES OF BUTCHER MEAT.—Per Stone of 14 Pounds.

Date.	London. Beef.	London. Mutton.	Liverpool. Beef.	Liverpool. Mutton	Newcastle. Beef.	Newcastle. Mutton.	Edinburgh. Beef.	Edinburgh. Mutton.	Glasgow. Beef.	Glasgow. Mutton
1849.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June . .	5 6 - 6 9	5 9 - 7 0	5 3 - 6 9	5 6 7 3	5 3 - 6 3	6 0 - 6 9	5 0 - 6 0	5 3 - 6 6	5 6 - 6 6	5 6 - 6 9
July .	5 6 - 7 0	6 0 - 7 3	5 6 - 6 6	5 9 - 7 0	5 6 6 6	5 9 - 6 9	5 3 - 6 3	5 6 - 6 6	5 9 - 6 9	5 9 - 7 0
Aug. .	6 0 - 6 9	6 0 - 7 0	5 3 - 6 3	5 9 - 7 0	5 6 - 6 3	5 9 - 6 9	5 0 - 6 0	5 3 - 6 3	5 6 - 6 6	5 6 - 6 9

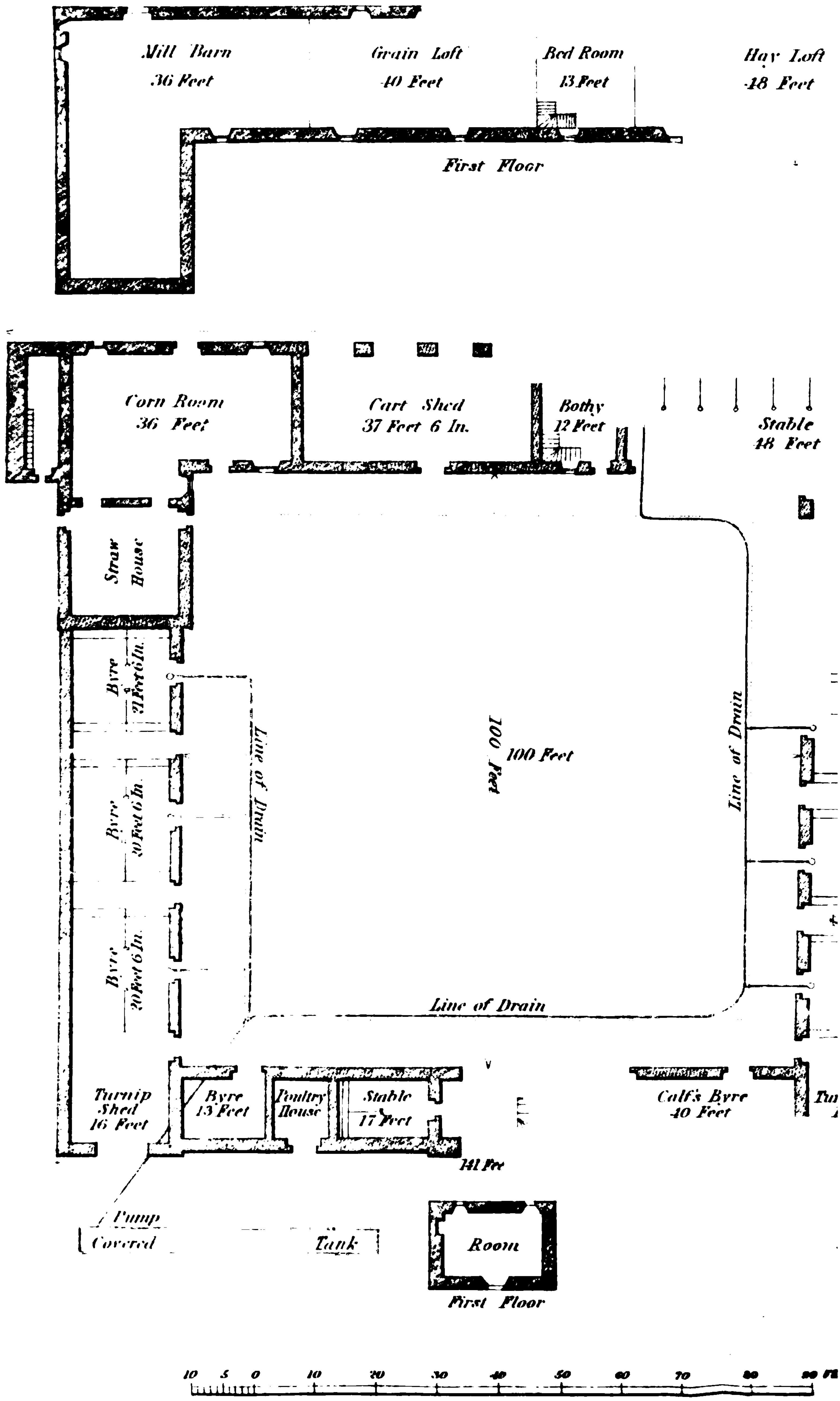
PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

English.	s. d. s. d.	Scotch.	s. d. s. d.
Merino, ...	11 6 to 17 0	Leicester Hogg, ...	9 6 to 13 6
. in grease, . .	9 0 to 12 6	. Ewe and Hogg, .	8 0 to 11 0
South-Down, ...	12 0 to 16 6	Cheviot, white, ...	7 6 to 10 6
Half-Bred, ...	9 6 to 12 6	. Laid, washed, . . .	6 0 to 8 6
Leicester Hogg, ...	10 6 to 14 0	. . unwashed, ...	4 6 to 7 9
[illegible] Hogg, . . .	8 6 to 11 6	Moor, white, ...	5 0 to 7 0
[illegible] . . .	5 6 to 7 6	. Laid, washed, ...	4 6 to 5 6
[illegible]	4 6 to 6 0	. . unwashed, ...	3 6 to 5 0



MARYPARK
THE PROPERTY OF
SIR JOHN MACPHERSON GRANT, BARONET
NOTE The lines of thorough draining are shown by single lines
The leading drains by double lines
CONTENTS
IMPERIAL
ARABLE

PLAN OF MARY PARK FARM STEADING.



LEGISLATIVE MEASURES OF THE SESSION OF 1849, RELATIVE TO AGRICULTURAL AFFAIRS, AND RURAL IMPROVEMENT.

THE following is an analysis of the various acts, public and local, passed in the last session of parliament, relating to agricultural and rural affairs.

DRAINAGE ACTS.

Of the two acts connected with this department of agricultural improvement, the most important is that (cap. 100) which received the royal assent on the last day of the session, entitled "An Act to promote the advance of private money for drainage of lands in Great Britain and Ireland." After reciting the titles of the acts passed in the sessions of 1846–7–8,* for authorising the advance of public money for the improvement of land by drainage, the preamble clause goes on to state that "it is desirable that works of drainage should continue to be encouraged, in order to promote the increased productiveness of the land, and healthiness of the districts where it is required, and to supply the demand for agricultural labour, especially at that season of the year when other sources are suspended." The clause then states, that the two millions sterling granted by the act of 1846 for Great Britain, and the one million sterling voted for Ireland, having been applied for and appropriated, and additional sums having been granted under subsequent acts for Ireland, that "applications have been made for a further sum of half a million and upwards for Great Britain, and for further sums for Ireland, and it is expedient that the same should be advanced by private individuals, and that owners of land should be enabled or authorised (with the sanction of the Enclosure Commissioners for England and Wales) to borrow or advance money to be expended with the like sanction in draining such lands." It is thereupon enacted, that the Enclosure Commissioners, and the Commissioners of Public Works in Ireland, shall be the commissioners for the execution of this act.

The second clause authorises any landowner in Great Britain or Ireland, desirous of improving his land by works of drainage, to borrow or advance money for such purpose; the sum so expended to be charged on the inheritance of the land. Application to be previously made to the commissioners to authorise the required loans, the report of whose officers, after inspecting the land specified, to determine what amount of money shall be authorised to be borrowed or advanced, the interest for the same not to exceed five per cent per annum; the commissioners, after the issue of their certificate of permission, to be at liberty, from time to time, to

* *Vide, Journal of Agriculture* for January 1848 and March 1849.

authorise an abandonment or variation of any part of the proposed works of drainage, as they may deem expedient. The provisions relative to the necessary notices contained in the act of 1846 are incorporated with this act. Where application for an authority to advance money is refused, or no money can be raised within six months from the allowance of an application, the expenses incurred by the commissioners or their officers are to be deemed a debt due by the applicants, and recoverable as a crown debt. In any case where more than one party shall be willing to contribute towards a required advance, the applicant, if willing to contribute thereto, shall have the preference as a lender, or to be entitled to name the party or parties who shall have such preference; the commissioners to name the minimum amount to be paid into the bank as one contribution towards such advance. Unless such contribution shall have been paid into the bank in contravention of the aforesaid provisions as to priority of right to contribute, (in which case the amount thereof shall be repaid,) the banker's certificate for the same shall be exchanged for a grant by the commissioners of rent-charge for twenty-two years, such rent-charge to be personal estate, to commence from the date of the banker's certificate, and to be payable by half-yearly payments during the above term. In cases where the owner of land himself shall advance the money, or part of the money, the commissioners, on being satisfied that the same has been duly and properly expended upon the drainage works authorised to be executed, shall issue a grant of rent-charge to be payable by half-yearly payments for twenty-two years, "and in all other respects to be on the same footing as a grant of a rent-charge to any third person." Rent-charges may be charged on several portions of the land included in applications for loan. The twelfth clause refers to the appointment of rent-charges, and is as follows—

That if it shall be represented to the commissioners that the land charged with any rent-charge under this act is occupied in separate farms, or shall have become the property of separate owners, or that the owner thereof is entitled thereto under separate titles, or for distinct and separate interests, or is desirous to sell or dispose of a part or parts of such land, or that for any other reason it will be desirable that such rent-charge shall be apportioned, it shall be lawful for the commissioners, with the consent of the owner or owners of the land charged with such rent-charge, by order under the seal of the commissioners to apportion such rent-charge, so that a separate and distinct rent-charge may become charged on such separate farm, or on the land of each owner, or on the land held under each separate title, or for each distinct and separate interest, or on the part or each part which the owner is desirous to sell or dispose of, and the part intended to be retained by him, or on other separate parts of the said lands, but so that no rent-charge under such apportionment shall be less than twenty shillings; provided that the commissioners shall, and they are hereby directed, before making any such order of apportionment, to see that due notice of the intended apportionment shall have been given to the parties entitled to give a receipt for the said rent-charge, or some or one of them, in order that they or he may, if necessary, dispute such apportionment.

Every rent-charge (without reference to the title of the parties making application) is to be deemed an indefeasible charge upon

the land comprised in the grant, subject only to the usual taxes and payments incidental to tenure, and prior to all other charges. All grants of rent-charges as to lands in Middlesex, Yorkshire, or in Ireland, are to be registered in the same manner as if such grants were made by deed by the absolute owner of such lands without the aid of this act. All grants of rent-charges in Scotland are to be registered in the general or particular register of sasines. Rent-charges are to be recoverable in England and Wales in the same manner as a rent-charge in lieu of tithes, under the Commutation of Tithes Act; and in Ireland, according to the provisions of 1 and 2 Vic. cap. 109; in Scotland rent-charges are to be recoverable in all respects as any feu-duty or annual rent. Every tenant or occupier who pays a rent-charge will be entitled to deduct the amount thereof from the rent payable by him to the reversioner, except where he has agreed to pay the same. Arrears of rent-charge not to be recoverable after three years. Advances under this act are not to be deemed a contravention of the condition of entail of lands in Scotland; "but every such rent-charge shall be a good and effectual charge upon and against such entailed lands to every other effects, and upon and against the rents and profits thereof." Trustees are not to be precluded by rent-charge from investing money in the purchase or mortgage of land charged. The twenty-first clause enacts—

That as between the several parties interested in any land charged with a rent-charge under this act, such parties shall respectively be bound to keep down and discharge the payments thereof, as if the same were interest payable upon a mortgage in fee on such lands.

The expenses in the Drainage Act of 1847, particularly mentioned as to be included among the expenses of works of drainage, both in Great Britain and Ireland, are to be included under the provisions of this act. Commissioners may cause all works to be inspected, and vouchers, bills of account, &c., to be produced, to ascertain the due execution of the work, and the amount of expense incurred. Where it shall appear to the commissioners, by reason of the circumstances of the land, or the neglect of the owner, or otherwise, any proposed works in respect of which money has been paid, and a rent-charge granted, cannot be executed; or that for any other cause all, or part, of such money will not be applied, the commissioners are authorised to indemnify against the rent-charge the persons liable to pay the same; but no part of the money is to be paid to the owner, upon whose application the money was advanced, or his representatives, until all other persons liable to pay such rent-charge shall have been indemnified against the same or released therefrom. The provisions of the act of 1846, relative to upholding drains, and keeping clean and open the outfalls, are to be deemed incorporated in this act. A register of certificates, grants, &c., is to be kept by the commissioners; the same to be

open at all reasonable times, for inspection by any person intere
in the land charged. A description of land by reference to any for
or other document, to be considered by the commissioners s
cient for the purposes of any certificate, grant, or order to be iss
under this act. By the thirtieth clause it is enacted, "for
amendment of the act of 1846," that where any owner of l
charged with a rent-charge under the provisions of that act s
redeem the same, the commissioners may authorise the annual r
charge to continue a charge upon such land for the remainde
the term, and shall be payable to the owner of the land, or
assigns, and be transmissible as personal estate. With the vie
removing doubts entertained under the former drainage acts, a
the necessity for all lands specified in the provisional certifi
being comprised in the certificate of advance, it is enacted by
thirty-first clause, that only such part of lands specified in the
visional certificate as the commissioners shall consider sufficie
to be comprised in the certificate of advance. The conclu
clause enacts, that, when cited for legal purposes, it will be s
cient to call this act "The Private Money Drainage Act, 1849

The second drainage act (cap. 23,) is entitled, "An Act to au
rise further advances of money for the improvement of la
property, and the extension and promotion of drainage and o
works of public utility in Ireland." This may be considere
supplemental act to the one passed in the session of 1847, w
authorised the Treasury to advance the sum of £1,500,000 for
purpose of facilitating the improvement of landed property in
land." By the present act, power is given to the Commissio
of the Treasury to advance "an additional sum," not excee
£300,000, for "landed improvements" in the sister kingdom
the owners thereof; the advances to be applied for the purp
and subjected to all the provisions named in the act of 1847.
third clause of the act of last session, after referring to ano
measure, passed also in 1847, which authorised the advanc
additional funds (to the extent of £250,000,) for "loans for dr
age," &c. in Ireland, proceeds to state that "it is expedie
authorise the advance of a farther sum of money for the said
poses." Such "further sum" the Commissioners of her Maje
Treasury are empowered to advance, to the extent of £200,
"as may, from time to time, be required for the extension
promotion of drainage and other works of public utility in Irela

ACTS OF ENCLOSURE.

Three acts of enclosure were passed last session, the most im
tant of which (cap. 83) is entitled, "An Act further to facilitate
inclosure of commons, and the improvement of commons and o
lands. After referring to the several Enclosure Acts passe
1845-6-7-8, and stating that "it is expedient that the provi

of the said acts should be further extended," the preamble clause proceeds to enact, with reference to the boundaries of parishes, that it shall be lawful for the valuer in the matter of any enclosure, with the approbation of the Enclosure Commissioners, to declare by his award how much, and which part, of any of the lands to be allotted or divided, or of any roads passing through the same, shall be deemed to be situate in the parish in which such allotted land, &c., shall be situate; provided that no such declarations shall be made in any award, where it shall appear to the Enclosure Commissioners that there exists any dispute as to the parish in which such land is situated, or that the boundaries of any counties would be affected by such declaration. Persons interested in any land to be inclosed under the provisions of the above recited acts, and having similar rights of common, or other similar rights, over the lands to be inclosed, may be dealt with as a class, on a meeting of such persons being called, and the assent of two-thirds in number present being obtained. The third clause refers to doubts that have arisen as to the provisions of the first of the above recited acts, (8 and 9 Vic. cap. 118,)—namely, whether, after a meeting shall have been held to give instructions to a valuer touching any enclosure, any other meeting, after such first, can be held for the purpose of giving further instructions; it is by this act enacted, that the commissioners may call other meetings for such purpose, subject, however, to all the provisions of the first recited act, as regards the first meeting, so far as the same shall be applicable to the second or any subsequent meeting. By the next clause, all the powers enabling the commissioners to complete proceedings under any local act of enclosure, are to be applicable to the act 6 & 7 William IV. cap. 115, (for "facilitating the enclosure of open and arable fields in England and Wales.") Commissioners are empowered to declare that an allotment in lieu of quit-rents, chief rents, or heriots, may be given to the lord of the manor to whom such quit-rents, &c., are payable out of any old enclosure, in respect of which an allotment would be made, the consent of such lord, however, to be obtained. All the provisions of the above recited acts applicable to the powers of exchange and partition, are, by this act, to extend and be applicable to the exchange of all rights of common, rights of fishing, manorial and other rights, &c.; and when two or more persons shall be interested, either jointly, severally, as a class, or in common, in any rights or property proposed to be exchanged or partitioned, the application of two-thirds in value, of such persons, shall be considered the application of all the persons interested therein. The eighth clause refers to separate tracts, and runs as follows:—

That, where lands proposed to be inclosed under the said recited acts shall consist of separate tracts of open, and common arable, meadow, and pasture lands or fields entirely, or in part; or of common or waste lands, subject to rights of common entirely, or in part; or shall otherwise consist of separate and distinct tracts, and it shall,

appear to the said commissioners that two-thirds in value, of the persons interested in the entirety of such tracts, shall have assented to the proposed enclosure on the terms and conditions in their provisional order specified, it shall be lawful for the said commissioners, if they shall see fit, to proceed therewith.

All the provisions of the recited acts, applicable to the fixing of the boundaries of any parish or manor, shall extend and be applicable "to the ascertaining, setting out, and fixing of the boundaries of any township, village, hamlet, or tithing not having separate overseers of the poor, and of a manor, although the same shall not abut or adjoin upon any other manor." The next clause declares that, if after the valuer shall have suspended or extinguished certain rights, or directed any allotment to be entered upon, any person other than the one for whom such allotment is intended shall exercise any act of ownership upon such land, "whether by erecting huts or other buildings or erections thereon, or by putting up fences, or digging therein," on being convicted before two justices of the peace, shall forfeit for every such act of ownership the sum of five pounds, the same to be applied by the valuer in aid of the expenses of the enclosure, or to the person in possession of such allotment. In reference to doubts that have arisen, whether, under the recited acts, a person interested in several subject matters of exchange, but held under several titles, or for distinct and separate interests, or subject to separate charges or incumbrances, can effect an exchange thereof, it is enacted by the concluding clause, "that the person so interested as aforesaid may effect exchanges of such several subject matters of exchange, in such and the same manner as if different persons had been interested therein." The present act, for the purposes of enclosure, is to be considered as part of the recited acts named in the preamble, and to be construed therewith.

The second act, (cap. 7,) is entitled "An Act to authorise the enclosure of certain lands, in pursuance of the Fourth Annual General Report of the Enclosure Commissioners for England and Wales." These lands are specified in the schedule annexed to the act, and are situated in the following counties:—Brecknock: Cefu, Ertham Common. Chester: Chorley Green; Bickerton Hills. Cumberland: Langwuthby Moor. Devon; Black Torrington; Holster Yard. Dorset: Buckland Newton. Hereford: Bradley. Kent: Westwell Leacon. Lancaster: Cadishead Moss. Nottingham: Oxton; Mansfield Woodhouse Forest. Norfolk: Bramerton Common. Oxford: Pyrton; Cowley Open Fields, The Marsh, Bullingdon Green, and Elder Stubbs, Oatlands, Botley, and Osney. Southampton: Abbot's Wood; Headley. Suffolk: Bell, Swan, and Silverlace Greens. York: Oakworth Common. York, West Riding: Dent. Westmoreland: Firbank Fells. In citing this act in legal instruments, it will be sufficient to use the expression, "The Annual Enclosure Act, 1849

By the third act relative to enclosures, (cap 57,) certain other lands are authorised to be enclosed "in pursuance of a Special Report of the Enclosure Commissioners of England and Wales." These lands and their localities are thus specified in a schedule annexed to the act:—Cornwall: Saint Ives Down. Cumberland: Ponsonby; Calder; Crosby, and Birkby. Kent: Brasted Chart. Norfolk: Swannington, Brandistow, and Haverland. Oxford: Hailey and Crawley. Radnor: Saint Harmon; Creigbyther. Somerset: Loxton. Suffolk: Rumburgh Common; Brockley; Bedfield Long Green; Bradfield Saint George. Sussex: Hailsham, Hellingly, and Arlington. Southampton: Rotherwick. In citing this act for legal purposes, it will suffice to term it "The Second Annual Enclosure Act, 1849."

TURNPIKE ROADS AND HIGHWAYS.

Five acts were passed last session relating to turnpike trusts and highways. The first (cap. 44) is entitled "An Act to facilitate the union of Turpike Trusts," and is founded on the expediency (as stated in the preamble) of establishing a better and more economical management of turnpike trusts, by uniting all that can be conveniently managed together, where the same can be effected without prejudice to the creditors of any of the separate trusts. With this view it is enacted, that where the general annual meetings of the trustees of two or more turnpike roads have, for three years, been held at the same place, or at places not more than ten miles distant from each other, two or more of the trustees of each of such roads may, on giving twenty-one days' notice, call a joint meeting of the trustees of the several roads for the purpose of taking into consideration a proposition for the union of the same; and if, at such meeting, it shall appear to a majority, being not less than two-thirds of the representatives of each trust then present, that such union is expedient, and that the same can be effected without injury to any of the creditors of the several trusts, the trustees may resolve to unite the same. A notice of such resolution, however, is to be sent, within twenty days after such meeting, to all the creditors, together with a report of the reasons for considering such a union expedient, and a statement of the income and expenditure of all the trusts proposed to be united; and on receiving an assent, in writing, from not less than three-fifths of the creditors, the union shall take place, and the same, with all the necessary particulars, be registered in the office of the clerk of the peace in every county through which the roads of such united trusts pass. The trustees of the several trusts are to be henceforth the trustees of the united trusts. All liabilities and payments, as well as all the tolls, profits, and other property of each trust, are to be considered as merged in the united trusts, provided that all special provisions, as to the amount of tolls or exemptions, &c. con-

tained in any act applying to a particular road, shall be held as referable to that road only, and not to the whole united trust; and provided also that nothing in this act shall be construed to affect the right or interest of any person to any office under any turnpike trust to which they may have been previously entitled. United trusts may hold their meetings at any place at which they might have been held prior to the union, and after the expiration of three years may, in like manner and on the same conditions, unite with any other trust meeting at the same. The concluding clause declares that this act is not to extend to Scotland or Ireland.

The second act (cap. 87), is entitled "An Act to continue certain Turnpike Acts in Great Britain for limited periods, and to make certain provisions respecting Turnpike Roads in England." In declaring the expediency of this measure, the preamble clause enacts that every turnpike road act in Great Britain, that would have expired before the end of the last session of parliament, shall be continued until the 1st of October 1850, and to the end of the then next session, except certain specified acts—namely, 6 Geo. IV. cap. 49; 9 Geo. IV. cap. 103; 7 and 8 Geo. IV. cap. 53; and 9 Geo. IV. cap. 107. The second clause refers to a schedule appended to the act, in which the titles of a variety of acts (eighteen in number, and applicable to different English and Welsh counties) are to continue in force until the 1st of November 1850, and no longer, unless parliament shall in the mean time continue the same. The third clause refers to the establishment of a sinking fund for the discharge of moneys hereafter borrowed; and enacts that, in every case in which the trustees or commissioners of any turnpike road shall borrow any sum on the credit of its tolls, they are empowered, in priority to all other payments, except the interest on such loans, and on any moneys owing on the security of the said tolls, to set apart five per cent per annum on the amount borrowed; and so often as the sum thus set apart shall amount to £200, the same shall be applied in the payment of a proportionate part of the moneys so borrowed, notice of a meeting for that purpose to be given to the creditors in some newspaper circulating in the locality of the road in question. The sums to be applied by the trustees to the creditor who shall, by proposal in writing, have offered to accept the lowest composition; in cases where two or more creditors shall have offered to accept an equal rate of composition, the trustees may determine by lot the preference; if, however, there should be no proposal, or there should, after applying the composition to applicants, remain a surplus, the same is to be divisible rateably among the creditors. Mortgagees in possession of every toll-gate or bar are invested with power to let or to farm the tolls of such gate or bar in like manner as the trustees; and all co[illegible] agreements, relative thereto, are to have the same

validity as if executed by the trustees or commissioners of the mortgaged road. The fifth clause refers to an act passed in the 4th of William IV. for requiring the annual transmission of the statements of turnpike trusts to the Secretary of State, with a view to their being laid before parliament. The provisions of this act, it seems, not having been in many cases duly complied with, it is enacted by the present act, that where in any year the trustees shall not hold their annual general meeting on or before the 25th of March, the clerk to such trustees shall make out a statement of the debts, revenues, and expenditure of the trust, and transmit a copy of the same to one of Her Majesty's secretaries of state on or before the 24th of April in such year; the penalty for non-compliance not exceeding ten pounds, nor less than five: this enactment is not to apply to any period during which the tolls are received by a mortgagee or agent. The next clause requires mortgagees in possession of toll-gates or bars to transmit, on or before the 25th of March, every year, to one of her Majesty's secretaries of state, an annual statement of the revenues of the said roads, during the year ending the 31st of December preceding, agreeably to a form prescribed in a schedule appended to the act; penalty for non-compliance, the same as in the foregoing clause. The concluding clause exempts Ireland from the operation of this act, and also Scotland, "except in respect of the continuance of the acts hereby continued," (namely, those enumerated in the schedule.)

The third act, (cap. 47,) is entitled "An act to continue certain acts for regulating Turnpike Roads in Ireland." After referring to a variety of acts passed in the 4th and 5th of her present Majesty, for making and amending the turnpike roads in Ireland, which would have expired on the 31st of July last, the preamble clause declares it expedient that the several acts alluded to should be "further continued" until the 31st of July 1850; or, if parliament be sitting, until the end of the then session of parliament. Three provisional clauses follow: one of which exempts from the operation of this act an act passed in the 7th and 8th Geo. IV. 66; another continues an act passed in the 9th Geo. IV. cap. 80, until the 1st of October 1850, and no longer; and the other continues an act passed in the 1st and 2d Geo. IV. cap. 38, for a like period.

The fourth act, (cap. 54,) is entitled "An act to continue until the 1st of October 1850, and to the end of the then next session of parliament, an act for authorising the application of Highway Rates to Turnpike Roads." The preamble clause refers to an act passed in the 4th and 5th of her present Majesty, for authorising for one year an application of a portion of the highway rates to turnpike roads in certain cases; which act having been continued from year to year, the object of the one passed last session is to "further continue" its operation until the 1st of October

1850, "and to the end of the then next session of parliament."

The next act (cap. 35) is entitled "An act for requiring annual returns of the Expenditure on Highways in England and Wales, to be transmitted to the Secretary of State, and afterwards laid before parliament." In reference to this act, it may be premised that in the 6th William IV., an act was passed for consolidating and amending the laws relating to highways in England, by the provisions of which every surveyor was required, within one month after his election or appointment, to lay before the justices of the peace at a special sessions, the account, (signed by himself, or by the district or assistant surveyor,) for the year preceding, of all moneys received and disbursed by virtue of that act; and also, that at the special sessions after the 25th of March in every year, the surveyor of each of the parishes within his division was required to verify his accounts. The object of the measure passed last session is to require periodical returns of highway expenditure; and for this purpose it is enacted that the clerks to justices at special sessions, shall prepare from the surveyors' accounts "a separate statement in writing (according to a form set forth in a schedule to the act) of the receipts and expenditure on account of the highways of each parish in such division;" the same to be transmitted within fourteen days after the special sessions, and for the preparation and transmission of which a fee of two shillings shall be paid; the penalty for neglecting to comply with this provision, "not exceeding five pounds nor less than forty shillings." The town-clerks of cities and boroughs, and clerks to trustees and commissioners, are, by a subsequent clause, also required, "within thirty days next after every annual or other periodical account of the receipts and expenditure of such council, trustees, or commissioners, in respect of the highways under their management, has been made out," to prepare and transmit a statement in writing, (as far as circumstances will permit,) of the particulars agreeably to the form prescribed in the schedule: the penalty for non-compliance "not exceeding ten pounds nor less than five." By the concluding clause, it is enacted that the act 5th and 6th William IV., and this act, shall be construed as one.

There was also one local road act (cap. 4) passed last session, "for more effectually repairing and maintaining certain roads in the counties of Roxburgh and Berwick." The preamble to this act, after reciting the titles of the three previously existing statutes, (viz. 46th Geo. III. cap. 48, 9th Geo. IV. cap. 104, and 3d and 4th Vict. cap. 66,) declares the same to be repealed in favour of the provisions of this act. The second clause declares that all the powers of an act passed in the 1st and 2d William IV. cap. 43, entitled "An act for Amending and making more Effectual the laws concerning Turnpike Roads in Scotland," shall be applied

to this act. The third clause enumerates the various gentlemen appointed trustees for carrying into execution the purposes of this act, any five or more of whom may, as often as necessary, and on giving due notice, elect new trustees. The clause relative to the qualification of trustees enacts, that no person other than the provost of Jedburgh, the bailie of Melrose, the eldest bailies of Lauder and Hawick, and the sheriff-depute of Roxburghshire, shall be capable of acting as a trustee, unless in the actual possession in his own right, or in right of his wife as fiar or liferenter, of lands in Roxburghshire or Berwickshire valued in the cess-books at £200 Scots; or the heir-apparent of a person so qualified, or a guardian of a minor enjoying lands of a like valuation. No person claiming as a trustee to have more than one vote, except he be the preses of any meeting, who shall, in case of an equality of votes, in addition to his deliberative voice, have a casting vote. All general meetings are to be held on the second Wednesday of September annually; the quorum of trustees at general or adjourned meetings to be five; a less number present to have the power of adjourning the meeting. The ninth clause states that this act shall be put in execution for the purposes of "surveying, amending, improving, widening, altering, straightening, repairing, and keeping in repair, the roads made and maintained under the second recited act," (namely, the 9th Geo. IV. cap. 104:) the respective localities of these roads are enumerated. Bonds, agreements, &c., entered into under either of the repealed acts, are to remain valid; and all tolls and duties on the roads specified in any of the said acts, are to be liable for debts presently owing on those respective roads, but for no other existing debt, provided always that "nothing herein contained shall be held to prevent the trustees under this act borrowing money under the authority of the same, from burdening the tolls and duties leviable upon the whole roads herein comprised, or such part of the same as they shall think proper." All tolls payable under the repealed acts are to continue in force until the expiry of the existing lettings, "and the roads heretofore maintained by statute labour money, shall be so maintained until assumed as turnpike under this act. In the subsequent clauses relative to the tolls to be taken, it is enacted that no tolls shall be taken more than once a-day within the distance of six miles. The produce of the tolls is to be apportioned to the maintaining and improving the roads comprehended under this act; to the payment of interest upon moneys borrowed; and where a surplus occurs, the same to be appropriated annually to the extinction of the principal of the debt. With respect to the exemptions from tolls, it is enacted that, besides those specified in the 1st and 2d William IV., "no toll whatsoever shall be demanded or taken for any carriage, horse, or cattle loaded with corn of any kind going to mills or kilns for the purpose of being manufactured, or returning therefrom, for

the use of farmers, their families, and cottagers, residing within one mile of any toll-bar which may be passed through." All tolls, together with the right of property in every turnpike, toll-house, building, garden, &c., are to be vested in the trustees appointed under this act. The concluding clauses declare that this act shall continue operative for thirty-one years; and that, for all legal purposes, it will suffice that it be entitled "The Roxburghshire and Berwickshire Roads Act, 1849."

LEASEHOLD LANDS.

Two important acts were passed last session relative to leasehold lands; one applicable to England and Wales, the other pertaining exclusively to Ireland. The former (cap. 26) is entitled "An Act for granting relief against defects in leases made under powers of leasing, in certain cases." Of the necessity of this measure we have a comprehensive explanation in the preamble clause, which sets forth that—

Through mistake or inadvertence on the part of persons granting leases, and through ignorance on the part of lessees of the titles of persons from whom leases are accepted, leases granted by persons having valid powers of leasing are frequently invalid, as against the successors in estate of such persons, by reason of the non-observance or omission of some condition or restriction, or by reason of some other deviation from the terms of such powers: and whereas leases granted in the intended exercise of such powers are sometimes invalid as against the successors in estate of the persons granting the same, by reason that, at the time of granting the same, the person granting the lease could not lawfully grant such lease, although at a subsequent time, and during the continuance of his estate in the hereditaments comprised in such lease, he might have granted the same in the lawful exercise of such power: and whereas it is expedient that provision should be made for granting relief in the cases aforesaid, in manner after mentioned.

The nature of the relief proposed, as specified in the subsequent clauses, is as follows—That where, in the intended exercise of any such power of leasing as aforesaid, whether derived under an act of parliament, or under any other legal authority, a lease shall be granted which, by reason of the non-observance or omission of some condition or restriction, is invalid as against the parties interested, such lease—in case the same have been made *bonâ fide*, and the lessee named therein, his heirs, &c., have entered thereunder—shall be considered in equity as a contract for a grant, at the request of the lessee, his heirs, &c., of a valid lease, to the like purport and effect as such invalid lease aforesaid, save so far as any variation may be necessary in order to comply with the terms of the power of leasing; and all persons who would have been bound by a lease lawfully granted under such power shall be bound in equity by such contract. By the third clause, the acceptance of rent under an invalid lease shall, as against the person accepting it, be deemed a confirmation of such lease. Leases invalid at the granting thereof may become valid, if the granter continue in the ownership until the time when he might lawfully grant such a lease. The fifth clause explains what shall be

deemed "an intended exercise of a power,"—namely, that when a valid power of leasing is vested in a person granting a lease, and such lease (by reason of the determination of the estate, or interest of such person, or otherwise) cannot have effect according to the terms thereof, independently of such power, such lease shall be deemed to be granted in the intended exercise of such power, although that power may not be referred to in the lease. A provisional clause enacts that nothing in this act shall be construed to prejudice the rights of lessees under covenants for title and for quiet enjoyment, and the lessor's right of entry for breach of covenants, &c. This act is not to extend to any leases of ecclesiastical corporations, or the leases of any college, hospital, or charitable foundation, or to any lease where, before the passing of this act, the hereditaments comprised in such lease have been surrendered or relinquished, or recovered adversely by reason of the invalidity thereof. Pending suits, also, are not to be prejudiced by this act. Scotland is, by the concluding clause, exempted from the operation of this act.—[A supplemental act to the foregoing (cap. 110) received the royal assent on the 1st of August, which "suspends" the operation of the above measure until the 1st of June 1850.]

The following act (cap. 105) "for converting the renewable leasehold tenure of lands in Ireland with a tenure in fee," aims at the accomplishment of a much needed reform in the lesseeship of lands in the sister kingdom. The justification for this measure, as stated in the preamble clause, is, that—

> Many lands in Ireland are held under leases and under-leases respectively with "covenants for perpetual renewal," and great expense is constantly incurred in procuring renewals under such covenants, and much litigation and inconvenience arise from such tenures; and it is expedient that such tenures should be converted, in manner hereinafter provided,. with "tenures in fee;" and that, except as herein excepted, all leases and under-leases of lands in Ireland, with covenants for perpetual renewal, granted or made after the passing of this act, should operate and take effect in manner hereinafter mentioned.

The clause then goes on to enact, that where lands in Ireland are held under any lease in perpetuity, the owner of such lease—whether the time for renewal has or has not arrived—may require the owner of the reversion to execute a grant, according to the provisions of this act, of the lands comprised in such lease; and the reversioner shall thereupon execute a grant to the owner of such lease of an estate of inheritance in fee-simple in such lands, subject to a perpetual yearly fee-farm rent, to be charged upon such lands, and to be payable at the same periods as the yearly rent of the lease. A similar power is given to the persons holding lands under any under-lease in perpetuity of any degree of tenure; and upon the delivery of every grant to the owner requiring the same, he shall execute and deliver to the owner executing the grant a counterpart thereof, the expense of the same to be borne by the owner to whom the grant is made: a proviso to this clause

enacts, that no grant shall be required where right of renewal is lost. The amount of the fee-farm rent to be the same as the yearly rent payable by lease or under-lease; and the value of the renewal, fine or fees, to be estimated with reference to the probable duration of the subsisting term, the average duration of life, and the respective periods for renewal. Where any subsisting exception or reservation interferes with the proper cultivation of lands, the lessee or under-lessee may require that such exception, &c. should cease, wholly or partially, in which case the fee-farm rent shall be increased by an amount equivalent to the value of the exception. The two subsequent clauses are provisional: one, declaring certain rights pertaining to timber, bogs, mines, quarries, &c., not to be commutable without the mutual consent of the owner of the lease and the reversioner; the other, enacting that compensation shall be awarded to the reversioner where there is a loss on the conversion of the reversion into a rent, such compensation to be estimated according to the difference in marketable value. A portion of the lands comprised in any lease or under-lease may, by consent of the owner required to execute a grant and the owner requiring the same, be allocated in lieu of fee-farm rent, or the fee-farm rent may be charged on part only of such lands. Grants are to be valid against all parts. Estates in fee-farm rent, &c., are to be descendible, as if the same were an estate of inheritance in fee-simple in reversion; and all estates created under grants are to be subject to the old uses, trusts, &c. The conversion of any estate under this act is not to revoke or prejudice testamentary dispositions; nor to give dower or curtesy where the same would not have been claimable before the conversion; or to affect any rights of lords of manors in royalties. All covenants by law implied on the part of landlord or tenant upon any lease or under-lease in perpetuity to the owner, granted under this act, are to be implied upon such grant. Covenants made to lessees or under-lessees, in substitution for like covenants contained in leases granted by the governor and assistants of the Irish Society, are also to run with the land. The conversion of the interest of lessees or under-lessees is not to affect any right of distress, or action which accrued before such conversion; the rights of superior owner, and the right to indemnification against superior rents, are also to be preserved. Where the owner of any under-lease in perpetuity is entitled to require the owner of a lease or superior under-lease to procure a renewal, the owner of such under-lease may, at the same time, require the former to execute to him a grant under this act. The acquisition of lands charged with fee-farm rent to operate to the extinction of a proportionate part only of the rent; the remaining part to be recoverable out of the residue of such lands. Where the owner of any reversion, lease [illegible] disability, or abroad, the guardian, trustee,

committee of the estate, husband, or attorney respectively of such owner, shall be substituted for the purposes of this act. The portion added under this act to any former rent is to be liable to deduction for poor-rate; but nothing in this act is to alter the existing liability to tithe-rent charge. The subsequent clauses, from the 20th to the 35th inclusive, refer to the legal processes to be observed in the Irish Court of Chancery and Exchequer for the recovery of rent, the adjustment of disputed rights, and any other matters that may render petition to the above courts necessary. The 36th clause enacts, that the owner of the reversion of a lease, or under-lease in perpetuity, shall be deemed the owner of the estate created on conversion. The next clause, referring to all future leases in perpetuity of Irish lands, we give in the text of the act.

And be it enacted, that every lease of lands in Ireland for one or more life or lives, with or without a term of years, or for years determinable upon one or more life or lives, or for years absolute, with a covenant or agreement for perpetual renewal, made after the passing of this act by any person competent to convey an estate of inheritance in fee-simple (and not so made in pursuance of a covenant or agreement entered into before the passing of this act) shall, notwithstanding anything therein contained to the contrary, be deemed to be and shall operate as a conveyance of the lands specified therein to the intended lessee, his heirs and assigns for ever, at a fee-farm rent equal to the rent expressed to be reserved in such lease; and all reservation of fine or fines upon, or fees for or in respect of such renewal, and all and every covenant, contract, or agreement for the payment of such fine or fees, shall be altogether void; and every contract for such a lease entered into after the passing of this act by any such person as aforesaid (not being a renewal of a contract in pursuance of an agreement in that behalf made before the passing of this act) shall, notwithstanding anything therein contained to the contrary, be deemed to be a contract for a conveyance of the lands specified therein to the intended lessee, his heirs and assigns, at a fee-farm rent equal to the rent in such contract proposed to be reserved; and any such fee-farm rent shall be recoverable by all the means and remedies provided for the recovery of fee-farm rents made payable by a grant under this act, and the provisions of this act, so far as the same may be applicable, shall be applied to such cases.

The concluding clauses enact that, in citing this act for all legal purposes, it shall be sufficient to use the expression, "the Renewable Leasehold Conversion Act;" and in like cases, in describing any fee-farm rent, payable under the provisions of this act, it shall be sufficient to term it the "Fee-farm Rent under the Renewable Leasehold Conversion Act."

ENCUMBERED ESTATES (IRELAND.)

There were few measures passed during the last session that more deeply engaged the attention of the legislature, and particularly the members of the Upper House, than the bill which received the royal assent on the 28th of July, for granting "further facilities" for the sale and transfer of encumbered estates in Ireland. Many of the important and popular amendments with which the act is invested, were the result of frequent and protracted deliberations in the select committee of the Lords, in whose report they were introduced.

The preamble and several subsequent clauses authorise the appointment of three commissioners (two to be a quorum) for the execution of the act, whose term of service shall be limited to five years, the salary of one of the commissioners to be £3000, and that of each of the two others £2000 per annum, the said commissioners to be ineligible to sit in parliament. Forms of application, and directions "indicating the particulars of the information to be furnished to the commissioners under this act," are to be framed and circulated by the commissioners, who are empowered to make general rules for regulating all proceedings (without fees,) the same to be laid before the Privy Council of Ireland, and, after confirmation, to be enrolled in the Irish Court of Chancery, and to possess all the effect of an act of parliament; the said rules to be laid before both houses of parliament within one month from the confirmation thereof, if sitting; if not, within one month from the commencement of the then next session. Commissioners are empowered to summon witnesses, and to require the production of all necessary books, deeds, and documents, and to exercise the same authority for enforcing the attendance of witnesses as is vested in the Irish Court of Chancery. All orders made by the commissioners may be enforced in England. By the 15th clause the commissioners are to be made a court of record, and to have all the powers, authority, and jurisdiction of a court of equity, and for ascertaining and allowing encumbrances and charges, and the amount due thereon, and also for allowing the rights of all persons in any land or lease, in respect of which application may be made under this act. All inquiries and matters may be referred by the commissioners to any one of the three, whose decision shall be binding upon the rest. Where land in Ireland, or a lease in perpetuity, or any lease for a term whereof not less than sixty years are unexpired at the time of application, or any church or college lease, shall be subject to any encumbrance, the owner of such land or lease may, within three years from the passing of this act, apply to the commissioners for a sale of the same. The next clause enables an encumbrancer to apply to the commissioners within the same period for a sale of the whole or part (as the commissioners shall deem fit) of any land or lease for discharging the encumbrances thereon; but no application is to be entertained unless the costs of any previous application be first paid. The 19th clause introduces a proviso, to the effect that, for the purpose of authorising an application for a sale under the act, no land shall be deemed sub- [illegible] encumbrance where the same shall not affect the inheritance, unless such encumbrance shall affect a term of not less than fifty years absolute unexpired, or a greater estate in such land, and shall have been created by the owner of an estate of an inheritance. When any encumbrance is subject to limitations of estate or interest, the commission[illegible] application by the first person

entitled to the income of such encumbrance, and may, after notices and hearing, direct a sale; provided that no part of such land or lease is subject to any receiver, and that the annual payments on charges do not exceed half the net income—the decision of the commissioners, in such cases, to be final. Occupying tenants, and lessees or under-lessees, whose rights may affect the land or lease to be sold, are required to produce, on notice from the commissioners, their leases, agreements, &c., for examination; the sale to be made subject to any annual charges affecting the land or leases. All sales are to be effected under the direction of the commissioners, whose conveyance shall be made under the seal of the commission. The purchase-money, in all cases, to be lodged in the Bank of Ireland to the account of the commissioners, who may invest the same in the funds. Encumbrancer or owner, on whose application a sale has been ordered, may bid and become the purchaser; in which case commissioners may authorise payment into the bank of balance of purchase-money, after retaining the amount of encumbrance. Conveyances, executed by the commissioners, upon the sale of land, to be effectual in passing the fee-simple and inheritance of the land to be conveyed. Conveyances or assignments are not to prejudice any right of common, rent charge, crown rent, or quit rent, &c., made in virtue of the 5th and 6th, and 10th and 11th of Victoria. Commissioners may order the delivery to purchasers of counterparts of leases, and agreements, and possession. The surplus of purchase-moneys, after payment of expenses consequent on the sale of land or lease, is to be applied, by order of the commissioners, in satisfaction of the encumbrances, &c., according to their priorities. Trustees may be appointed by the commissioners for any of the purposes of this act. Where any money, arising from a sale, is not immediately distributable, or the parties entitled thereto cannot be ascertained, the commissioners are empowered to order the same to be paid into the Court of Chancery or Exchequer. The 36th clause refers to lands included in different applications, and enacts, *inter alia*,—

That where there shall be separate applications to the commissioners for sales under this act, of any land, and of any lease in the same land, or of two or more leases in the same land, or there shall be such applications for sales of different undivided shares of any land or lease, it shall be lawful for the commissioners, where they shall see fit so to do, to include, with the consent of the persons by whom such respective applications may be made or prosecuted; and if any other persons whose consent the commissioners may, under the circumstances, think fit to require, in the same sale, upon such terms as they think fit, such land and lease, or such leases, or such several undivided shares as aforesaid; and where there shall be separate applications for sales under this act, of any land, and of any lease in other land, or of different lands or leases in different lands, it shall be lawful for the commissioners, where, from the lands being intermixed, or from other circumstances, it shall appear to them convenient so to do, to include, with such consent as aforesaid, such land and lease, or lands or leases, in the same sale, upon such terms as they may think fit.

The next clause is also an important one, of which the leading provisions are:—

That if any land or lease to be sold under this act shall be subject to a lease or under-lease for years or lives, comprising other land at an entire rent, it shall be lawful for the commissioners to apportion the rent between the land to be sold and the remainder of the land subject to such rent; and where it is intended to sell under this act a part only of any lease in perpetuity, or other lease, it shall be lawful for the commissioners, where they shall think fit, and (having regard to the rights and interest of the owner of the reversion) it shall appear to them just so to do, to apportion the rent reserved by such lease between the land to be sold and the remainder of the land; the commissioners to direct notices of such intended apportionment to be given to the proper parties.

The 38th clause makes provision for persons under disability, such as minors, idiots, lunatics, &c., who might, (if not under disability,) have been made party to any proceeding under this act; the guardian, committee of the estate, or husband respectively of such parties, are empowered to make applications and give consents. Any proceedings under this act are not to abate or be suspended by death or transmission of interest. In every proceeding the commissioners to have full power to give or withhold costs and expenses. Application may be made to the commissioners for a sale under this act, and by them ordered to take place, "notwithstanding any pending proceedings in a court of equity in England or Ireland, or any decree of any such court of equity already made for sale, and notwithstanding the owner may have power, under an act of parliament or otherwise, to make a sale." After the order of the commissioners authorising the sales of any land or lease, proceedings for a sale under decree of an equity court may be stayed, and no suit, &c. to be commenced under the act of the previous session, ("to facilitate the sale of encumbered estates in Ireland,") pending proceedings under this act, without leave of the commissioners. On application for the sale of an undivided share, or after the sale, the commissioners may, on application of the party interested, and giving notices to the owner or owners of the other undivided share or shares of the same land or lease, and, hearing the parties, make an order for the partition of the same—such order to have a map or plan annexed, showing the part allotted in severalty in respect of each of the undivided shares. Where an application is made for the sale of any land or lease, or after the sale, the commissioners may, on application of a party interested, who may be desirous of exchanging all or any part of such land for other land which the owner thereof may be willing to give in exchange, cause proper inquiries to be made; and, on being satisfied that such exchange would be beneficial, direct it to be made accordingly. The 45th clause refers to the partition of land, "not subject to be sold under this act;" and enacts that the commissioners may, upon the application of the owners of the several undivided shares of any land in Ireland, who may desire to effect a partition of the same, cause inquiries to be instituted for ascertaining whether such partition would be beneficial to the parties interested in the respective shares; [illegible] affirmative, then to make an order for such partition

accordingly, annexing to such order a map, showing the part allotted in severalty in respect of such undivided share. Exchanges of lands, "not subject to be sold under this act," may also be effected on the application of the owners; and after the commissioners have satisfied themselves that such proposed exchange would be beneficial, a map specifying the lands given and taken in exchange to be annexed to the commissioners' order. The 47th clause refers to the division of intermixed lands; and, having elicited special attention in the parliamentary progress of this act, we give it entire: —

And be it enacted, that it shall be lawful for the commissioners, upon the application of any number of persons who shall be separately owners of parcels of land "not subject to be sold under this act," or as to which no proceedings for a sale under this act shall be pending, so intermixed, or divided into parcels of inconvenient form or quantity, that the same cannot be cultivated or occupied to the best advantage, but forming together a tract which may be divided into convenient parcels, and who shall desire to have the whole of such tract divided into convenient parcels, to be allotted in lieu of the old parcels, to make, or cause to be made, such inquiries as the commissioners may think fit, for ascertaining whether such proposed division and allotment would be beneficial to the persons interested in such lands; and in case the commissioners shall be of opinion that the proposed division and allotment would be beneficial, they shall make an order for the division and allotment thereof accordingly, with a map or plan thereunto annexed, in which shall be specified as well the parcels in which the several persons on whose application such order shall have been made, were respectively interested before such division and allotment, as the several parcels allotted to them respectively by such order; and the parcels of land taken under such division and allotment shall go and enure to and upon the same uses and trusts, and be subject to the same conditions, charges, and encumbrances, as the several lands which the persons taking the same shall have relinquished or lost on such division, would have stood limited or been subject to, in case such order had not been made.*

In the case of land in respect of which no proceedings for a sale under this act are pending, no order of partition, exchange, &c., as above, shall be made by the commissioners, until three months' public notice of the same shall have elapsed. All conveyances, assignments, and orders for partition, exchange, &c., made by the commissioners, under their seal, to be deemed conclusive; nor are the commissioners to be restrained in the execution of their powers under this act by injunction, or their proceedings be removable by

* It may not be unuseful to put on record, in this place, the remarks made by Lord Stanley, in reference to the 45th, 46th, and 47th clauses. On the bringing up of the report of the select committee upon the bill:—"He (Lord S.) must call the attention of their lordships to one amendment which had been made in this measure. It was the adoption of a power which existed in England, and which, he believed, was not generally known to the public. He alluded to the power enabling the commissioners, where estates were held in common and were intermingled, to effect a change of land among the proprietors, free from all expenses to which the parties would be subjected by the ordinary process of the law. At the present moment, in England, power was given to the Enclosure Commissioners—and a similar power was now proposed to be given to these commissioners in Ireland—not only with respect to estates which were not encumbered, but also with respect to estates which were encumbered and intermingled, to effect an interchange of them by a simple process; of that process he highly approved, and his object in mentioning it was to make it better known to the people of England."—*Lords' Debate, June 22,* 1849.

certiorari, &c. The commissioners may review, rescind, or vary any of their orders; and where they shall sanction an appeal against any order, such appeal is to be made to the Privy Council of Ireland within one calendar month from the order appealed against, and to be reported on by a judicial committee appointed by members of the Privy Council, whose order on the appeal shall be final. The two concluding clauses refer, one to the penalty for false swearing; the other, to the construction of terms, &c., in this act. A schedule containing the form of conveyance on sales by the commissioners, is appended.

The commissioners appointed under the foregoing act are—The Right Hon. Baron Richards, Dr Longfield, and Mr Hargrave. The commission, for the sale and transfer of encumbered estates in Ireland, was opened on the 24th of October last. On that occasion, Baron Richards expatiated at some length on the machinery by which it was proposed to carry out the intentions of the legislature; in the course of which he adverted to the rules and forms that had been approved of by the Privy Council, as well as those emanating from the commissioners themselves, both of which he recommended all persons desirous of becoming acquainted with the subject to study attentively. The following portion of his lordship's address is extremely important to be generally known:—

"Upon the subject of sales before us, (said his lordship,) I would wish to call particular attention to our 16th rule, and chiefly because that rule establishes a practice essentially varying from the practice of every court of equity both in England and Ireland. By that rule we have excluded ourselves from opening any sale, by reason of an advance in the bidding merely. Many persons, I dare say, will disapprove of the principle of that rule, but we do not expect to please all parties; we can only say, that the principle of that rule engaged our most earnest and anxious consideration; and, upon the deepest reflection, we arrive at the conclusion, that the practice of opening sales from time to time, by reason of an advance in the biddings, was calculated to damp very much the ardour of *bonâ fide* purchasers, to delay the final completion of the sale and winding up of the cause, and, in fact, more or less to damage all parties interested in the case. It is essential, however, that this most important alteration in the mode of procedure, in respect to sales of property, should be very generally known, and we trust it will obtain universal publicity; on the other hand, to guard against a collusive or fraudulent attempt to have property knocked down at a gross undervalue, we have reserved to ourselves a power, by the 15th rule, to adjourn the sale of any lot, if, in our opinion, the highest price offered is clearly inadequate. This is a power which, I apprehend, we shall very seldom have occasion to exercise, and, most likely, never shall exercise, except where we have reason to suspect something in the nature of fraud or contrivance in the case. It is right, however, that we should have such a power, to be used or not as the circumstances of the case may appear to render necessary. I see no well-founded reason why persons desirous of investing capital in a profitable manner, should refrain from doing so in the purchase of land to be sold under our court: for, first, they will have a clear and indefeasible title, not depending upon the preservation of any ancient deeds or charters, or on the accuracy of searches, or on the opinions of counsel; but deriving its validity from the statute under which we are acting; and, secondly, they will have a clear possession, free from all claims of tenancy, save those subject to which the property is expressly sold; but, chiefly, the purchaser under our court will obtain the benefit of his contract at once, and not be delayed, as is sometimes the case, for years, not knowing, or almost to the latest moment, whether his purchase is to be on or off."

ANIMAL CRUELTY, &c.

The act passed last session (cap. 92) "for the more effectual prevention of cruelty to animals," is based (as expressed in the preamble) on the expediency of repealing the provisions of two

statutes passed in the reign of William IV. relating to the cruel and improper treatment of animals, with a view "to make other and more effectual provisions for promoting the objects and purposes of the said acts." The first of these provisions enacts, that if any person shall ill-treat, over-drive, or torture, &c. any animal, such offender shall be subject to a penalty not exceeding five pounds; a similar penalty is imposed upon any person who shall keep or use, or act in the management of any place "for the purpose of fighting or baiting any bull, bear, badger, dog, cock, or other kind of animal, whether of domestic or wild nature;" provided always, that every person who shall receive money for the admission of any other person to any such places shall be deemed to be the keeper thereof. A like penalty is also imposed on every person who shall "in any manner encourage, aid, or assist," at the fighting or baiting of the above-named animals, &c. Offenders convicted of injuring any animal, or injuring any person or property, shall pay, by way of compensation to the owner of the animal, or person injured, a sum not exceeding ten pounds; such compensation, however, not to affect the punishment for beating or ill-treating the said animal. Persons impounding animals are to provide "a sufficient quantity of fit and wholesome food and water to such animals," on penalty, for every case of neglect, of twenty shillings; and where it shall occur that animals impounded have been confined for more than twelve successive hours without sufficient food and water, it shall be lawful for any person to enter the pound and supply what is needed without being liable to any action of trespass, and the reasonable cost of such food and water shall be paid by the owner of the animal, before its removal, to the person supplying the same. The seventh clause supplies an omission in the 26th Geo. III. for regulating slaughtering houses, and enacts that every person and persons licensed according to the provisions of the above act, refusing or neglecting to affix over the door or gate of the house or place where the business of slaughtering horses or other cattle is carried on, in large legible characters, his, her, and their name and names, together with the words "Licensed for slaughtering horses, pursuant to an act passed in the 26th year of his Majesty King Geo. III.," shall forfeit a penalty not exceeding five pounds, and a like penalty for every day such refusal or neglect shall continue. Horses or other cattle (not intended for butcher-meat) on being brought to a slaughtering-house, to have the hair immediately cut off from the neck, and the animals to be slain within three days, a sufficient quantity of wholesome food and water to be supplied in the interim; omitting or neglecting the same, to be liable to a penalty not exceeding five pounds. Horses or other cattle sent for slaughter are not to be employed, under a penalty of forty shillings for every day so used. A correct description of cattle, for the purpose of distinction and identity, to be kept by slaughter-house

keepers under a penalty of forty shillings. Persons licensed to slaughter horses, are not to be licensed as horse-dealers at the same time. Persons conveying animals upon any vehicle in such a manner as to cause them unnecessary pain, to forfeit three pounds for the first offence, and five pounds for the second and every subsequent offence. Complaints under this act to be made within one calendar month after the commission of the offence. Offenders not paying penalties may be committed to the House of Correction for two months, with or without hard labour. Persons convicted under this act, and having at the time of apprehension charge of any vehicle or animal, the same may be detained as security for payment of penalty and any expenses necessarily incurred. All penalties are to be appropriated: one moiety to the overseers of the poor of the parish in which the offence was committed, in aid of the rates; the other moiety to the prosecutor, or to such other person as to the justice shall seem fit. Where the penalties are incurred in Ireland, the first moiety is to be paid to such hospital, dispensary, or infirmary, as the justice may direct. Proprietors of public vehicles — the drivers or conductors of which having subjected themselves to complaints under this act—may be summoned to produce their servants under a penalty of forty shillings, "and so, from time to time, as often as he shall be summoned in respect of such complaint, until he shall produce the said driver, conductor, or servant." The remaining clauses (with the exception of the last) refer to the legal forms necessary to be observed in cases of appeal, actions, venue, &c. By the last clause it is enacted that this act shall not apply to Scotland.

Another act, of a relative nature to the foregoing, (cap. 30,) was passed last session, "for the better preservation of sheep, and more speedy detection of receivers of stolen sheep in Ireland." This measure has been deemed expedient from the continuous increase of sheep-stealing in the sister kingdom, and the difficulty hitherto experienced in detecting the offenders. Power is consequently given by this act to constables to search dwelling-houses, outhouses, gardens, &c. suspected of having concealed therein carcass of any stolen sheep or lamb, or any mutton, fat, skin, or fleece; and if any such be found in the possession of any person who shall not be able to prove that he lawfully came by the same, he shall, on conviction, pay a sum not exceeding five pounds, and, on non-payment of penalty, be imprisoned for three calendar months with or without labour, unless the penalty and charges be sooner paid. The penalty to be divided into equal portions, one of which to be given to the nearest dispensary; the other, according to the provisions of the 1st and 2d Victoria, cap 99, for the more effectual levying of fines, &c. If a case shall appear fit for indictment by felony, the justice may abstain from adjudicating in a summary way. Offenders punished under this act are not to be proceeded against a

second time for the same offence. Prosecutions under this act are to be commenced within two months after the commitment of the offence.

MARKETS AND FAIRS.

Three acts were passed last session relative to the establishment and regulation of markets and fairs for the sale of agricultural and other produce, applying, respectively, to the counties of Stafford, Devon, and Lincoln.

Longton Market Company Act.—This statute (cap. 6) is entitled "An Act for better establishing and maintaining the market-place and markets at Longton, heretofore called Lane End, in the parish of Stoke-upon-Trent, in the county of Stafford." The preamble clause states, that the said market and market-place being inadequate for the demands and convenience of the inhabitants of the town and neighbourhood, it is expedient that the same should be enlarged, and more permanently established and regulated: it then declares that the "Land Clauses Consolidation Act, 1845," the "Companies Clauses Consolidation Act, 1845," and the "Markets and Fairs Clauses Act, 1847," are to be incorporated with this act. The purposes of this statute are proposed to be carried out through the medium of an incorporated company of shareholders, to be called "The Longton Market Company;" the capital of which to be limited, in the first instance, to £16,000, divisible into two hundred shares of £80 each; and in the event of the said capital proving insufficient, power is given to the company to borrow money on mortgage to the amount, not exceeding, in the whole, of £5330: such power, however, not to become operative until the original capital shall have been all subscribed for, and a moiety paid up. Certain sums already owing to mortgagees, amounting to £3250 (as specified in a schedule) to have priority over any mortgages or bonds to be created by this act. Quarterly meetings are to be held on the first Thursday after Lady Day, Midsummer Day, Michaelmas Day, and Christmas Day. Seven shareholders to constitute a meeting; and all questions to be decided by the majority of shareholders present. The possession of two shares to be the qualification for voting at meetings, and no shareholder to be entitled to more than one vote. Extra general meetings may be convened on the requisition of not less than three shareholders holding two shares each; no shareholder to hold more than three proxies. The number of directors not to exceed seven, nor be less than five, three of whom to form a quorum; the possession of four shares to be the qualification of a director. Three directors to retire annually, by rotation, but subject to be re-elected. The 27th clause invests the company with power to hold markets or fairs for the sale of cattle, and also meat, fruit, vegetables, and all other vegetable commodities, at such days and hours as they

may think fit, in the place where the same has heretofore been holden, or in any part of the land and premises belonging to the company specified in any accompanying schedule. A like power is also given to alter, or reconstruct, the present market and the buildings, &c. attached thereto. All moneys arising from the markets, tolls, and rents, to be appropriated, first, to the expenses incidental to the maintenance of the markets, &c., and, secondly, to the payment of a dividend not exceeding five per cent per annum. Surplus moneys are to be appropriated to the formation of a sinking fund, to be applied to the improvement of the township of Longton, or otherwise. A series of clauses follow, authorising the collection of tolls, weighing and measuring, &c.—the particular rates being set forth in an annexed schedule. Power is given to the company to lease the market for any period not exceeding seven years, or to lease or assign leases of standings in the market. The two concluding clauses refer, one to the protection of the saving rights of the lord of the manor of Longton, and the other to the application of penalties—which are to be appropriated, one half to the informer, and the remainder towards forming the proposed sinking fund.

Torquay Market Company Act.—This statute, (cap. 56,) is entitled "An Act for regulating and maintaining markets in the town of Torquay, in the county of Devon, and for constructing convenient market-places therein." The necessity for this measure is based on the following reasons set forth in the preamble clause, viz.:—

> Whereas the town of Torquay, in the parish of Tormoham, in the county of Devon, and the neighbourhood thereof, has of late years greatly increased in population, and is much resorted to by visitors: and whereas a market has, for many years past, been held in the said town for the sale of meat, fish, poultry, eggs, butter, fruit, vegetables, and other commodities: and whereas the market-place where the said market is held is unfit for the wants of the said town; and it would be of great benefit and advantage to the said town, and the neighbourhood thereof, if the said market were placed on a permanent footing, with proper rules and regulations for conducting and managing the same, and if one or more new market-place or market-places were provided within the said town, and if the said market was removed to, and held in and upon such new market-place or market-places.

The purposes of this act are also proposed to be carried out by means of an incorporated company of shareholders, to be called "The Torquay Market Company," the capital of which to be limited to £7000, divisible into 1400 shares of £5 each; power being given to the company to augment the above amount by borrowing to the extent of £2333, but not till the original capital shall have been subscribed for, and a moiety paid up. The number of directors to be fourteen, to be increased to fifteen, but not to be reduced below nine: the quorum of a meeting of directors to be five, three of whom to go out of office annually. The first ordinary meeting of the company to be held within six months after the passing of the act (it received the royal assent July 13, 1849.)

Power is given to the company to construct, upon lands described in a schedule annexed to the act, " a new market-place or market-places, with all necessary buildings and works, approaches, and conveniences thereto, for the exposure and sale of such marketable commodities as are usually sold in markets or fairs." Previously, however, to commencing any erections, the plan is to be submitted to the approval of the commissioners acting under a statute passed in the 5th and 6th of William IV., for improving the parish of Tormoham; such new market-place to be built on the proposed site at " Warren Place," and when completed to constitute the only market-place within the limits of this act. The said market-place to be completed within three years. Power is also given to the company to enlarge such market at any time when it shall be found to be not sufficiently capacious for public accommodation. The owners of the existing market to receive compensation from the company. Slaughter-houses are to be erected on the proposed site " at Upton, in the parish of Tormoham, or within a quarter of a mile thereof;" penalty for slaughtering elsewhere to be five pounds for every offence. Lands to be taken by the company for extraordinary purposes to be restricted to three acres. The 27th clause refers to the mode in which all business shall be conducted after the opening of the new market, and runs as follows:—

Be it enacted, that after the said market-place or market-places shall be opened for public use, every person, other than a person being a licensed hawker, or a person hawking or selling within the said limits any fish, eggs, or fruit, or selling fish by wholesale from any vessel or boat alongside of the quays in Torquay, and delivering the same upon the quays when sold, who shall sell or expose for sale in any place within the said limits other than in the said market-place or market-places, or in his own dwelling-place or shop, any article or articles in respect of which, or of the shed, stall, bulk, block, trestle, bench, table, standing-place, or station used or occupied in the said market-place or market-places for the sale or exposure for sale, whereof stallages, rents, or tolls, are by this act authorised to be taken, shall for every such offence be liable to a penalty not exceeding forty shillings: provided always, that nothing herein contained shall extend to authorise the sale by retail, or the exposure for sale by retail, of any fish, eggs, or fruit on the said quays, or on any highway or street within one quarter of a mile of the same; and provided further, that the sale of fish by wholesale from any vessel or boat alongside of the said quays, shall be limited to such place or places only as the harbour-master of Torquay for the time being shall direct and appoint.

All fish delivered on the quay to be removed within two hours, under a penalty of forty shillings. The seven succeeding clauses refer to the tolls demandable, and to the power to lease, or assign leases of slaughtering-houses, weighing-houses, standings, &c. The saving rights of lords of manors are protected from infringement by this act, which is declared to be not exempted from the provisions of the " Public Health Act, 1848." The " Companies Clauses Consolidation Act, 1845," the " Lands Clauses Consolidation Act, 1845," and the " Markets and Fairs Clauses Act, 1847," are to be incorporated with this act, the limits of which are to comprise and include the parish of Tormoham.

Louth Markets and Fairs Act.—This statute (cap. 78) is entitled "An Act for regulating and improving the markets and fairs in the borough of Louth, in the county of Lincoln." The preamble clause declares it expedient that the mayor, aldermen, and burgesses of Louth should be empowered to maintain, regulate, and improve the markets and fairs in the borough, and to provide new or additional places when necessary. It is then enacted that the "Lands Clauses Consolidation Act, 1845" be incorporated with this act, and also the "Markets and Fairs Clauses Act, 1847," with the exception of that clause in the latter act which relates to the receipts and expenditure of the undertakers. The following provisions in the "Commissioners' Clauses Consolidation Act, 1847" are also incorporated with this act—viz., with respect to the contracts to be entered into, and the deeds to be executed, by the commissioners; the appointment and accountability of the officers of the commissioners; mortgages to be executed by the commissioners; the making of bye-laws; and the giving of notices and orders. All business to be transacted by committees, who are to be appointed by the corporation or council; and no business is to be proceeded with unless a quorum of three be present: the acts of such committees to be submitted to the council for their approval. The Treasurer and Town-clerk of the borough of Louth to be the treasurer and clerk respectively for the purposes of this act. All rents, stallages, tolls, &c., to be carried to the account of the borough fund; the books of accounts, &c. to be open to the inspection of the members of the corporation; and a general audit to take place in the months of March and September in every year; and when audited, an abstract of the accounts to be printed, and a copy of the same supplied to applicants on payment of a reasonable price. The Corporation are empowered to borrow money on mortgage or bond for the purposes of this act, to the extent of £3000. Power is also given to raise money by way of annuity; the terms of which to be in conformity with annuities granted by the commissioners for the reduction of the national debt. The Corporation are also empowered to appropriate any lands vested in them, or to purchase or take by way of exchange, rent or lease lands, messuages, &c., for the purpose of erecting new or additional market place or places for fairs, with all proper buildings, &c., for the sale of such marketable commodities and commodities sold at fairs as are enumerated in a schedule annexed to the act. Slaughter-houses necessary for the supply of the borough and the neighbourhood to be provided by the Corporation. Lands taken for extraordinary purposes, to be limited to ten acres. The markets, tolls, buildings, &c., may be leased for any period not exceeding seven years. A penalty of forty shillings is imposed for every offence of selling without leave of the Corporation, "in any place within the limits of this act, except [illegible] the markets or fairs, or in his own dwelling-place or

shop," any articles subject to tolls, &c., demandable by the Corporation. Power is given to search for unwholesome provisions; and where it shall appear, from sufficient evidence, that the same were intentionally exposed for sale, the owner shall be liable to a penalty not exceeding ten pounds "for every animal or carcass, fish, or piece of meat, flesh, or fish, or any poultry or game so found." A series of enactments follow, relative to penalties, power to take tolls for the markets and fairs, weighing and measuring, &c. The saving rights of the warden and assistants of Louth are protected from infringement by a specific clause. The Corporation to be interdicted from selling or mortgaging any lands for the purposes of this act, which they could not have similarly disposed of previously, without the consent of the Lords of the Treasury; nor is anything contained in this act to prejudice or affect the operation of the "Public Health Act, 1848." The "borough of Louth" is defined to be the limits within which this act, and the incorporated acts, are to be put in force. The operation of this act to commence from the 1st of August 1849: and for all legal purposes the act is to be called *The Louth Markets aud Fairs Act*, 1849.

Petitions.

The following petitions, on matters kindred to agriculture, were presented to parliament during the last session:—

Agriculture—For relief: 589 petitions, 86,572 signatures. (Ireland,) for relief: 1 petition, 125 signatures.

British Produce—For protection: 1 petition, 33 signatures.

Corn and Cattle—For imposition of duty on: 1 petition, 682 signatures.

County Rates and Expenditure Bill—For alteration of: 1 petition, 1 signature. In favour of: 59 petitions, 4859 signatures.

Cattle, Sheep, (Ireland) &c.—Respecting depredations by killing, &c.: 20 petitions, 709 signatures.

Cruelty to Animals Bill—For alteration: 1 petition, 173 signatures.

Flax—Respecting cultivation of, in Ireland: 1 petition, 1 signature.

Freemen's Lands—For alteration of law: 2 petitions, 57 signatures.

Game Laws—For repeal: 8 petitions, 8 signatures.

Game Licenses—For alteration of law: 1 petition, 1 signature.

Hops—For repeal of duty: 48 petitions, 3057 signatures.

Highways—For alteration of law: 1 petition, 1 signature.

Highways Bill—Against: 1 petition, 26 signatures.

Highways District Surveyors Bill—Against: 2 petitions, 278 signatures.

Highways Bill, (1847)—For including South Wales: 1 petition, 146 signatures.

Incumbered Estates (Ireland) Bill—For compensation: 1 petition, 9 signatures.

Landlord and Tenant, (Ireland)—For alteration of law: 8 petitions, 1653 signatures.

Leasehold Tenure of Land (Ireland) Bill—Against: 2 petitions, 2 signatures. In favour of: 2 petitions, 155 signatures.

Malt—For repeal of duty: 385 petitions, 35,302 signatures.

Malt and Hops—For repeal of duty: 7 petitions, 1816 signatures.

Poor-Law—For alteration: 55 petitions, 11,202 signatures—respecting

assessment: 10 petitions, 1220 signatures—respecting settlement: 15 petitions, 246 signatures—respecting Waste Lands: 1 petition, 234 signatures.

Public Roads—For alteration of law: 1 petition, 1 signature; (England and North Wales bill)—against: 282 petitions, 19,041 signatures.

Real Property Transfer Bill—Against: 3 petitions, 132 signatures.

Roads and Bridges (Scotland)—For inquiry: 5 petitions, 5 signatures.

Sheep &c., Contagious Disorders Prevention Act—For appointment of Inspectors, &c.: 1 petition, 104 signatures.

Smithfield Market—Against removal: 16 petitions, 1938 signatures—for removal: 9 petitions, 1469 signatures.

Tithes—Against alienation of: 13 petitions, 253 signatures—Tithe Rent Charge (Ireland) for appropriation to the support of the poor: 1 petition, 36 signatures—for alteration of tithe: 1 petition, 59 signatures; —Tithe Commutation Act, for inquiry into: 1 petition, 1 signature; —for alteration of law: 6 petitions, 64 signatures.

Turnpike Trusts—For inquiry: 1 petition, 1687 signatures.

NOVA SCOTIA QUESTION.

"We are in the progress of a social revolution which threatens to swallow up the middle classes of society, and beggar and ultimately enslave the lower."—Rev. Dr BEGG's pamphlet *On our Sinking Population, and Rapidly increasing Public Burdens*. 1849.

"Of the climate, soil, and capabilities of New Brunswick, it is impossible to speak too much. No portion of the American continent possesses greater natural resources for the maintenance of large and flourishing communities. Unbounded materials of agricultural, commercial, and manufacturing industry are there."—*Final Report of the Officers employed by Government to survey the Line of the Halifax and Quebec Railway*, 1849.

THIS article is to be considered a continuation of the one which appeared in the number of this Journal for July last, entitled "Scottish Agricultural Resources, and their Neglect, in the Western Hemisphere." The magnitude and importance of the subject will, it is conceived, excuse an early return to it. No question affecting the social interests of Scotland, at once so comprehensive and practicable as the *Nova Scotia Question*, has arisen since the period of the Union. The revival in New Scotland—a territory still containing 24,088,623 acres of vacant soil—of Scottish baronet plantation rights, and Scottish baronet plantation duties, involves the retention of that magnificent province, and its systematic settlement on the monarchical principle. It contemplates the maintenance of the ancient crown domains of Scotland in their original breadth and extent; and the restoration of the functions and utility of a great state institute, founded for the purpose of hereditarily advancing the "opulence, prosperity, and peace" of the Scottish subject on both sides of the Atlantic. The *Nova Scotia Question* is one which concerns the domestic welfare of every family of Scottish blood, high or low, rich or poor. It is interwoven with the nobler national reminiscences of the past, and bears upon the higher national destinies of the future. It is inseparably associated

with our national aggrandisement—with our national enterprise—with our national industry—with our national happiness—with our national glory.

The vast importance of the colonial and transmarine possessions of the British crown, is gradually becoming better understood by the people of the United Kingdom. They contain a cultivable area of two million square miles, and include broad continents, rich islands, fertile plains, strong fortresses, and secure havens, in each quarter of the globe. From our colonies we receive the varied products of every clime; and in return we export manufactures, and other commodities, to the yearly value of twenty millions sterling. The field which our colonies present for the creation of new markets for our commerce, remunerative employment for labour, and safe and profitable investments for unemployed capital, cannot be exaggerated. Whilst in the British islands, on an area of seventy-six million statute acres of land, of which thirty million acres are waste, we have a density of four hundred inhabitants to each square mile of arable surface—a density increasing at the rate of more than one thousand births a-day—in the Canadas there are not six individuals to each square mile of area, in Australia not three, in Southern Africa not two. Yet with all this territorial wealth—with colonial resources which could with ease sustain in comfort and abundance an addition of one hundred millions to their present population—the sum of £200,000,000 sterling have been levied by law, and expended for the relief of the poor in England and Wales alone, between the years 1815 and 1849. In the United Kingdom, the sum now annually raised as poor-rate is nearly £8,000,000 sterling. The number of paupers relieved yearly is about four millions, and there are at least two millions able-bodied poor ready to work for their bread, but unable to find employment. Colonisation has therefore become a matter of urgent national, as well as individual necessity; and it is of vital importance that the mind of the various interests in the state should be imbued with a right understanding of this momentous subject, since a wise use of the immense resources which a merciful Providence has placed at our disposal, may avert the evils of increasing pauperism, bankruptcy, and social disorganisation.

But upon the general question of colonies and colonisation, it is not our purpose to dwell. During the last few years of famine visitation and general distress, the press has teemed with numberless articles, pamphlets, addresses, speeches, &c., not only upon the condition and prospects of our colonies, but likewise upon the evils of promiscuous emigration and unregulated colonisation. From the distraction produced by the state of affairs in Ireland, and by the revolutionary convulsions in Europe, two sessions have passed without these matters receiving legislative attention; but they cannot fail to concentrate the anxious regards of parliament on its next

assembling. Indeed, a combination of events and circumstances, both at home and in every quarter of our transmarine empire, now demands this. There is not a rate-payer in the kingdom who does not begin to perceive that he is directly interested in the cultivation of our waste colonial lands, seeing they offer prompt and permanent relief from the growing pressure of pauperism on property. There is not a father in the British isles, having one or two educated sons to provide for, who—recollecting the cry for the reduction of the national armaments—the twenty-two thousand applicants for government situations, who besieged Sir Robert Peel within the course of a few weeks from his last accession to office—and the fact that the sum-total of an officer's pay and allowance, who died in the army after seventeen years' active service, set against the money paid for his successive commissions, left a balance in favour of the said receipts of only £78, being at the rate of £4, 11s. 9d. *per annum*, in return for services in all climates of the globe, one of which at length proved fatal—will not look to regulated colonisation as the wisest and best opening to comfort and independence which any spirited youth can embrace. Merchants, traders, manufacturers, and shipowners, whether viewing with satisfaction or alarm the recent change in our commercial policy, must see in the expanding growth of colonial population, industry, and wealth, relief from the suffering inevitably arising from all states of transition, whether for good or evil. The politician who is desirous of strengthening the basis of that wide-spread monarchical power, which already owns the allegiance of no less than one hundred and thirty millions of the human race—the clergyman who is anxious to see new states founded on the enlightened humanities of the Christian faith—the philanthropist who feels that the happiness of his brother man cannot better be developed than in the peaceful employments which new and rising communities give birth to—and the statistician, who reflects that the divine injunction, "Be fruitful and multiply," must ever be a curse instead of a blessing, until such time as we also practise the long-neglected duty of "Replenishing the earth, and subduing it"—each looks to systematic colonisation as the main lever by which to raise up the depressed condition of all ranks and classes of the British subject.

But to depart from general observations—and which are introduced at this stage only with a view to stimulating the long dormant public mind in Scotland upon colonisation matters—with the exposition before us upon "our sinking population, and rapidly increasing public burdens," which Dr Begg's recent pamphlet contains, and the fact that pauperism has increased in Scotland, in the course of eleven years, 350 per cent, whilst within the same space the multiplication of crime has had no parallel in the down-going [illegible] of any nation, it is high time that Scotland should awake and

resume her colonising functions.* Since the publication of our former article, the Corporation of London, with a view to extending the Ulster plantation, have taken steps to purchase 200,000 to 300,000 acres of land in Connaught—a project which has been hailed, by one section of the English press, as "one of the most hopeful events of our time," and by another has been spoken of in terms of commendation so flattering as these:—"No act of modern times, that occurs to the recollection, surpasses this large-minded and generous design." But what is this Irish settlement extension, when put in juxtaposition with the contemplated revival of that plantation undertaking in New Scotland, which James I. declared he would make "a royal work of his own?" A revival which would add upwards of 830 new parishes, of 3000 acres each, to the industrial resources of the mother country, and do that, in fact, which Dr Chalmers referred to, when, professing himself not confident of any great economic good to result from the repeal of the corn laws, he observed,—"Were the sea to recede ten miles from our shores, all round the island, and leave an exterior margin to that extent of arable land, *then* there might take place some such expansion in our affairs—some such vast enlargement to the capabilities and wealth of our nation as, in the estimation of some people, corn-law abolition would give rise to." If the commencement of this royal plantation of Nova Scotia in 1625, when the population of the whole of Scotland was much under one million souls, was approved of by the Scottish Estates, on the ground that they considered the undertaking to be "a purpose highly concerning his Majesty's honour, and the good and credit of his ancient kingdom," well may its revival, at a moment when a tenth part of our fellow-subjects are in a state of abject poverty, and when, under an effective poor law, of only three years' duration, we have already within 1 per cent as heavy rates as England, where a lax and much misused poor law has existed for three centuries, be considered by the whole of Scotland as—to use the language of a noble and powerful writer, now alas! no more—"a grand and a glorious project, one which extends its influence over a vast space, both in the Old World and in the New, for it affects the destinies of hundreds of thousands of human beings, not only now, but for ages yet to come."

Of the article in the July number, introductory to this, entitled —"Scottish Agricultural Resources, and their Neglect, in the Western Hemisphere," a Scottish journalist has observed,—"The present number opens with a powerful and eloquent exposition of the value and advantages of Nova Scotia to Scottish emigrants,

* We have a statement in print before us, mentioning that, "within these forty years, (in the course of which population has advanced about 65 per cent in Great Britain and Ireland,) crime has increased in England 700 per cent, in Ireland about 800 per cent, and in Scotland about *three thousand six hundred* per cent!"

and advocates, with great ability, the settlement of that colony, comprehending New Brunswick, Gaspé, &c., on the original principles and views of its founder. The proposal is essentially based on the revival of Scottish baronet rights, and Scottish baronet duties, in the western hemisphere. The writer calls for a union of all ranks in Scotland to carry forward this grand scheme, and we trust it will command the attention it obviously merits." Whilst an English journalist has remarked,—"The principal article in the present number of this well-known publication, is entitled,—'Scottish Agricultural Resources, and their Neglect, in the Western Hemisphere.' We do not know the author, but we can confidently say, he has conferred upon his own country in particular, and upon the kingdom at large, a great benefit by calling attention to the immense sources of national prosperity which lie within our grasp." If it shall be asked, then, how does it happen that our baronets with their great family rights, and our people with their great national burdens, do not make common cause, and put forth a united and vigorous effort in this business? It may be answered, because public opinion in Scotland has long been a *vox et preterea nihil* in the legislative councils of the empire; because the public mind in Scotland, in all the higher gradations of life, is a reprobate mind in regard to whatever best concerns the moral and material interests of mankind; and because the public press in Scotland is a discordant and conflicting press, never waging against apathy, against parsimony, against inhumanity, in high places, an independent effectual warfare. Hence, in such a calm of political elements as now exist, and at a moment when there abounds in the United Kingdom social grievances calling for redress, which are far more afflictive than those which, two hundred years back, produced the great civil wars; there is up to this (the eleventh and present) hour, an entire abandonment of fore-thought, of provision, of contrivance for a broad and permanent mode of relief for the excess that there is in population, for the annihilation of those causes which give rise to pauperism and its attendant train of evils—namely, idleness, disease, and crime. Scotland, as regards Highland destitution and city vagrancy, is walking in the same steps as Ireland pursued for more than the tenth part of a century, dating from 1832. In that year, commissioners appointed by Earl Grey's government reported to the British nation the fact, that 'there then existed in Ireland 2,385,000 of the people in a condition always bordering on starvation, and sometimes in a state of actual famine." Each subsequent year these numbers steadily increased, and yet, during that period, nothing whatever was attempted by the aristocracy, the clergy, or the legislature, to [illegible], to diminish, to remedy, or to eradicate, the monstrous evil. Providence gave us sixteen long years of grace—we passed them [illegible] morbid apathy to the unexampled sufferings of our

fellow-subjects. But at last the Almighty foreclosed upon us by the annihilation of their food. The night, long delayed, came when no man could work; and what has been the penalty? In money for relief, in 1847, we paid £8,000,000,* for foreign grain we expended £31,000,000, for defalcations through bankruptcy £30,000,000,† for railway share depreciation £28,000,000,‡ and for government stock declension £150,000,000! So much for pounds. Shall we enumerate also the moral and physical catastrophes of the case? One million persons, according to Mr John O'Connell, perished within Ireland herself. A tumultuous flight of nearly 250,000 famished and panic-stricken wretches, across the Atlantic, carried plague, poverty, and disaffection, into our colonies there. In eight weeks alone, in the autumn of that year, Irish immigration into Liverpool reached 22,143 souls; from the 12th of January to the 27th of October, 262,675 souls.§ Glasgow, through similar inundations, became one vast lazar-house of disease, wretchedness, and vice. The *Montreal Herald*, in March last year, published the report of the Immigrant Committee of that city for 1847, which sets forth the fact that, of those who left the British isles in that year to seek a home in Canada, no less than *twenty-five thousand* had already found a grave.||

If, then, in the sister island, these vast calamities—calamities which have not only overturned the social fabric in Ireland, but which have also shaken to their foundations the agriculture, trade, and commerce of Great Britain—owe their rise to political misrule from without, and from internal apathy on the part of the wealthier orders to the wants and sufferings of the masses, to the self-same causes it is to be ascribed that, in Scotland, two famine visitations have pass over the nation without leading as yet to the adoption of any broad and comprehensive plan for the popular amelioration. Shall it be said no commission appointed by government ever reported concerning Scotland, what Earl Grey's commission above adverted to reported as to Ireland? Look to the progress of the *Nova Scotia Question*. That question was urged upon public attention in 1837, at a time when such was the distress of a large pro-

* According to Mr Twistleton, the Irish Poor-Law Commissioner, the Treasury, and the British Association, have together given about £12,000,000 sterling for the relief of Irish distress, since November 1845.

† Mr Herries stated in the House of Commons, 17th February 1848, that 220 failures of considerable importance occurred in 1847; that 85 of these represented property to the amount of £12,000,000, and that the whole loss was estimated at £30,000,000.

‡ See *Times*, 2d October 1847.

§ *Liverpool Standard*, 27th October 1847.

|| The deaths, from similar causes, in 1848, exceeded 13,815, making together upwards of 38,815 *deaths*—an amount of national blood-guiltiness paralleled alone by the inordinate cupidity which railway speculation has exhibited in late years: the railway bills passed by parliament in 1845, to the close of 1848, authorise an expenditure of upwards of £242,351,320.

portion of our Highland fellow-countrymen, that the inhabitants of Tyree assembled in the face of day, and came to the solemn resolution only to eat *one* meal in the twenty-four hours—a meal, too, consisting principally of sea-weed and shell-fish gathered from the rocks. It was urged upon public attention in 1839, when the London Highland Destitution Relief Committee presented a representation to her Majesty's government, setting forth "That the appalling state of destitution to which one hundred and sixty-eight thousand inhabitants of the Highlands and Islands of Scotland were reduced in the year 1837, and the misery that has existed in some of the Highland districts since that period, now loudly demand the immediate adoption of a systematic plan of emigration by whole families, as the only means of preventing a recurrence, year after year, of the same degree of frightful distress and suffering to which the Highland peasantry have of late been subjected." The *Nova Scotia Question* was urged upon public attention in 1841, when a select committee of the House of Commons, appointed to inquire into the condition of the population of the Islands and Highlands of Scotland, and into the practicability of affording the people relief by means of emigration, found and reported, "that it was established by the evidence before them, that an excess of population existed beyond that for which the country could afford the means of subsistence, or furnish adequate employment, along that part of the western coast of Scotland, which includes portions of the counties of Argyle, Inverness, and Ross, as well as amongst the islands; that the excess of population, who are for the most part for a period of *every year* in a state of great destitution, was variously calculated at from forty-five to eighty thousand souls; that a well-arranged system of emigration, in order to relieve the present state of destitution, and as preparatory to any measures calculated to prevent a return of similar distress, would be of primary importance; and that the concurrent testimony of all the witnesses examined led the committee to believe that the country is not only *liable* to a return of such a visitation as that which occurred in the years 1836 and 1837, but that in the nature of things it *must* recur, as the population is still rapidly increasing in spite of any check which the landlords can oppose, and without any corresponding increase in the natural productiveness and resources of the country." The *Nova Scotia Question* was urged upon public attention in 1844, when the moneyed banking power [illegible] Scotland was estimated to be not less than £40,000,000; when [illegible] ks had £25,000,000 deposits in their hands, on which they [illegible]y allowed two per cent;* when, some months prior, on the Relief Bill of Paisley there were eleven thousand eight hundred [illegible] four names; when the statistics of typhus fever in Glasgow,

* [illegible] 23d November 1844.

during the space of four years, exhibited a holocaust of sixty-two thousand and fifty-one victims; and when the published parliamentary list of railway share gamblers, in Scotland, exhibited the names of a number of peers and baronets as subscribers for stock from £5000 up to £180,000. It was urged on public attention at a crisis when Canadian outbreak—fomented in this country by radical declaimers on the one hand, against what they called "the baneful domination of the mother country," and by ministerial tricksters on the other, to that pseudo-cry, "Colonial responsible self-government"—cost Great Britain to extinguish it more than £2,000,000 sterling; at a crisis when corn-law repeal—hounded onward by men who declared that their capital "owns no allegiance to the soil of England," and that they hope to live to see the day when "not one blade of corn will be grown within her shores"—placed in jeopardy agricultural property in the British isles of the value, according to Mr M'Queen, of £3,258,910,810; at a crisis when, with fully fifteen millions of their fellow-subjects at home in a condition of *non-consumers*, our manufacturing interest are disposed to do that which, sooner or later, will raise against them the hearts and hands of every just-minded statesman and operative throughout the world—namely, to wage an exterminating producing warfare against the whole world, with a five hundred and ninety-eight million *mechanical hand*-power;* at a crisis when the legislature, notwithstanding that the following axiom in social ethics was vindicating its supremacy—"a proper distribution of the resources of a state is absolutely necessary to the integrity of its existence, because the neglect of it must terminate either in anarchy or despotism"—incorporated stock-jobbing companies for only one description of gain-making, authorising investments to the incredible amount of no less than £350,000,000 sterling; and at a crisis when our next neighbours, under a pressure of calamities far less overwhelming than those which Great Britain has recently suffered, and still endures, broke away from the moorings of social life—overturned, in the twinkling of an eye, a mighty monarchy with all its aristocratic institutes, and set a revolutionary ball in motion, which has run like a meteoric storm over Europe, prostrating dynasties, constitutions, and powers. Finally, this question is urged on public attention now, in the commencement of the first year of the latter half of the nineteenth century, and at an interval of thirty-six years from the time when war sheathed its brand at Waterloo; when every city, town, village, and parish in Scotland

* "The wealth produced by the addition of steam-power to manual labour is said to equal the productions of 600,000,000 beings. If, then, we reckon that 2,000,000 persons are employed in manufactures, the additional power which machinery gives is equal to 598,000,000 hands—and if we assume this proportion between labour and machinery, it would require *three hundred* nations, employing an equal number of artisans, to produce the same amount of manufactures."—*Trades Weekly Messenger*, 5th July 1848.

contains more or less a parish mass of outcasts, eating like a cancer into the vitals of society; when Glasgow alone contains thirty thousand vagrants, whose intense moral and physical destitution reproaches humanity, although the assessment, which five years back was under £30,000 a-year, now reaches £200,000; when the casual poor of all Scotland, which amounted, in 1847, to sixty thousand, exceeded, in 1848, the number of one hundred and twenty-six thousand; when poor-rates, which, in 1836, were £171,042, had swollen, for the year ending the 14th of May 1848, to £544,334, and are still augmenting; when Dr Macleod's observation, emitted before a committee of the House of Commons in 1841—"I live in awful terror of a recurrence, in the Western Highlands and Islands, of the great distress of 1836 and 1837, for the slightest failure of the potato crop in any one season must occasion it," is worthy of being recalled to remembrance, seeing that in extensive districts in Inverness-shire, Ross-shire, and Argyle, the potato crop is reported "to be very seriously affected by disease," and that "owing to the poverty of masses of people in the west coast, unprecedented destitution will exist;"* when the ejections that have recently taken place, and the ejections which are threatened shortly to take place, have led to the appointment of a deputation of the Highland Committee of the Free Church to visit the people of the distressed and proscribed districts; and when a calamity impends over this nation, which, unless averted, will produce evils more enduring, more disastrous, than all that have flowed from potato-crop rot, from railway speculation mania, and cholera visitation—namely, the loss of Canada. The loss of that continent of dominions, brought by steam within eight days of our shores, stretching from the Atlantic to the Pacific, in which God in his mercy has spread a bountiful table for the supply of the wants of all the surplus population of the British race until the end of time.

It would be to overcrowd the pages of this Journal were we to detail or particularise the manner in which the Nova Scotia question was urged upon public attention during the several periods enumerated, and under the peculiar circumstances noticed—periods of social distress, and circumstances of social need, unparalleled in the antecedent history of any other people or nation on the surface of the globe. But we will extend this article so far as to introduce into it one of the more recent documents emanating from the Committee of Baronets, formed in November 1844, to conduct the claims of the Order to a judicial determination. For this purpose, we quote from the columns of the *Morning Herald*, of the 17th of October last year, (one twelvemonth from the time at which we write,) the following "Memorandum and Protest," which was

* *Times*, 6th October 1849.

placed in the hands of the Right Honourable Earl Grey, her Majesty's principal Secretary of State for the Colonies, on the 2d of June 1848, by a deputation from the Committee of the Baronets of Scotland and Nova Scotia for Nova Scotia Rights, consisting of the Honourables Sir William A. Maxwell, Sir W. Ogilvie, Sir Frederic Hamilton, Sir Thomas M. Cunninghame, and Sir Richard Broun, Baronets:—

"The Deputation have the honour to wait upon the Colonial Minister, pursuant to a series of Resolutions which were passed by the Committee of the Baronets of Scotland for Nova Scotia Rights, at a meeting held in London on the 23d ult., the Hon. Sir William Alexander Maxwell, Bart., of Calderwood, presiding.

"The objects for which the Deputation have been appointed are threefold:—1. To present a copy of a compilation, entitled 'THE NOVA SCOTIA QUESTION, with Observations Geographical and Statistical—Historical Summary of Events relative to the Baronetage of Scotland and Nova Scotia—Roll of Existing Members—List of Charters, and Opinions of Counsel.' 2. To submit on behalf of the Order, that, in lieu of all territorial claims, a consolidated Grant shall be made to the Baronets of 2,500,000 acres of the vacant land in New Brunswick, upon the line of the proposed Railway between Halifax and Quebec; and, 3. To place in the hands of her Majesty's Government a formal PROTEST against the sale, grant, or concession of any of the vacant territory within the province of New Scotland, as originally bounded, pending the Settlement of the Claim of Right now urged by the Baronets.

"In discharging the duties devolved by the Committee on the Deputation, its members embrace the opportunity of drawing Earl Grey's special attention at this juncture to the fact, that the revival, in British North America, of the chartered rights and objects of the Baronetage of Scotland and Nova Scotia, would be a work of combined justice, policy, and humanity. As regards Justice, the crown charters, acts of parliament, and other legal instruments founded upon (upwards of two hundred in number) demonstrate, beyond all doubt or cavil, that the rights and privileges which they vest in the Order are still valid, subsisting, and effectual. The Policy of restoring to activity and usefulness such a great monarchical institute as the Baronetage of Scotland and Nova Scotia, would be a means of rapidly settling, with a loyal and attached landocracy, yeomanry, and peasantry, (the main constituent elements of British society,) that portion of our vast Transatlantic empire which, from geographical position, mineral resources, and water facilities, is, and must ever be, the *arx et domicilium* of British power, industry, and enterprise, in the western hemisphere, is too self-apparent to require comment. Whilst the Humanity of hastening the time when regulated Emigration and Colonisation shall become the passion of the great as well as the necessity of the

humble, will not be denied after the recurrence of a second Famine Visitation within the space of ten years, by any one who reflects that never was there an age or country in which problems in Population of more signal difficulty, or awful importance, arose to demand practical solution, than those which multiply in Great Britain at the present day.

"The Deputation cannot advert to the second matter intrusted to it—viz., to submit that, in lieu of all territorial claims, two-and-a-half millions of acres along the line of the proposed Railway between Halifax and Quebec shall be assigned to the Baronets out of the twelve million acres of soil now vacant in New Brunswick—without observing that no possible inconvenience, on the one hand, can arise to the Colonists from closing with a proposition by which all litigation will be avoided; whilst, on the other, and that at a crisis when the pillars of civil order are being everywhere shaken, there would be an entire absence of any disposition, on the part of the home government, to countenance an infraction of Royal covenants, and a depraving of statute laws. It is a solemn and binding engagement between the Crown and the Baronets, twice ratified and confirmed by parliament, that 'no lapse of time, non-user, or any other adverse circumstance whatsoever,' shall bar the rights and privileges which are vested in the Order by their charters. Nor will the propriety of the restitution of these rights be denied by Ministers to a Body that has ever deserved well of the Sovereign and the nation, seeing that, since 1798, no less than *ten* several consecutive territorial concessions have been made, to satisfy the unjust demands of not merely a rival, but a revolted State.

"The charters, acts, and other documents referred to in the Compilation on the Nova Scotia Question—a copy of which publication is placed herewith in the hands of the Colonial Minister—constitute a complete chain of historical and legal evidence in support of the claim of right preferred by the Baronets. With such indefeasible grounds to proceed upon, and seeing that questions connected with subsistence and population will successively arise to embarrass the nation, the Deputation deem it to be impossible that a wise and paternal government, actuated by due fidelity to the Crown and love for the people, will fail to recognise the duty of restoring the rights in Nova Scotia of the Scottish Baronetage, and making the Order again subservient for the great and paramount ends for which it was devised by the wisdom and patriotism of former sovereigns, privy councils, and parliaments.

"The duty of restoring the public functions and utility of the Scottish Baronetage, as a body constituted for ever to advance 'the opulence, prosperity, and peace' of Scotland, by and through the right colonisation and settlement of Nova Scotia, is one alike onerous upon its members and the Crown. Corruption or non-ility in a great monarchical institute is, under any circumstances,

a state evil of enormous magnitude—one which reflects equally upon the reigning Sovereign, as the representative of the Royal founder, and upon those whose titles and prerogatives have descended upon them as retaining fees for personal exertions. When James I. annexed Nova Scotia to his ancient kingdom, 'that its use might arise to the benefit of that kingdom,' and projected the erection of the Baronetage to superintend its plantation, he declared he would make the business a 'Royal work of his own.' And his last injunction to the Privy Council of Scotland, dated from his deathbed, on the 23d of March 1625, was, 'Persevere for the furtherance of this Royal work, that it may be brought to a full perfection—because it is to be the foundation of so great a work, both for the good of the kingdom in general, and for the particular interest of every Baronet.' Whilst, then, in compliance with that Royal commandment, and in consideration of the necessities now pressing upon all ranks and classes of the subject in Scotland, the Baronets are bound in honour and conscience to revive the uses of their Order, our gracious Queen, her ministers and government, are no less bound in honour and conscience to facilitate the restoration of the Baronetage, and to do whatever is needful to render it again the state organ of utility, in that noble but neglected domain of social happiness and national aggrandisement which its Royal institutor intended it hereditarily to be.

"Finally, whilst this committee, as representing the interests of the Scottish Baronetage, consider the time has arrived when they may look with confidence to the government for aid and encouragement, as regards the claim of right now urged by the Baronets; nevertheless, pending that settlement, they have deputed it to this Deputation to lodge in the hands of her Majesty's government, a formal protest against the sale, grant, or concession of the vacant soil in any of the districts of the Royal Province of New Scotland as originally bounded, and which comprehends Nova Scotia *proper*, New Brunswick, Gaspé, Anticosti, Prince Edward's Island, Cape Breton, &c. In discharge, therefore, of this trust, the Deputation call Earl Grey's particular attention, as presiding over the colonial department of her Majesty's government, to the following clause in the foundation charter of the Scottish Baronetage, viz., that the said charter 'is and shall be valid, sufficient, and effectual, in all time coming, in all points thereof, against the Crown, its heirs and successors, and against all other persons whatsoever, in all the courts of the crown, and in those of its heirs and successors, and in all other places whatsoever, at all times and occasions, notwithstanding whatever law, custom, prescription, practice, ordinance, or constitution hitherto made, ordained, and published or provided, and notwithstanding any other matter, cause, or occasion whatsoever.' And the Deputation formally Protest against the sale, grant, or concession of any of the lands still vacant in t

Royal Province of New Scotland, as originally bounded, pending the issue of the proceedings in which the Baronets are now engaged; protesting and declaring that all such sales, grants, or concessions, if any such shall be made to any person or bodies whatsoever, from and after this date, are and shall be null and void in law, notwithstanding whatever practice, expedient, or device may be set up or alleged to the contrary.

"Signed by order of the Committee, and on behalf of the Deputation, this 2d day of June 1848.

"W. A. MAXWELL, Bart., *Preses.*
"R. BROUN, Bart., *Hon. Sec.*"

In addition to the step taken by the Committee of the Baronets of Scotland for Nova Scotia rights, of placing this *Memorandum and Protest* in the hands of the colonial minister, and transmitting copies of it to the lieutenant-governors of Nova Scotia and New Brunswick, the committee have also had prepared an elaborate "*Petition of Right*," with a view to raising proceedings in a court of law, should an equitable arrangement with the government not be effected. Having procured a copy of the opinion of counsel upon this petition, we append it to this article, thinking that it will possess much interest, not only for the Baronets, and those connected with them by ties of blood, but also for the Scottish people at large: and with these two documents in print—the "Memorandum and Protest" and the "Opinion of counsel on the Baronet claims,"—and the facts before us, bearing upon the social state and condition of society, which we have brought together in the earlier portion of this article—what farther need be said in advocacy of the movement of the Baronets, or in exposition of the duty which all ranks and classes owe to the state, and to each other, as regards the advancement of it to final success? Let it not be considered for a moment that this question is one of importance alone to the hundred and fifty individuals who form the members of the Scottish baronetage. The magnificent possessions, amounting in the whole to upwards of 70,580 square miles, more than twice the extent of Scotland, which James I. annexed to, and incorporated with, his ancient kingdom, are the birthright property of every Scottish subject. The union of Scotland and New Scotland, says Charles I., in a letter addressed to the Baronets in August 1632, "emanated from our late dear father's royal care, for the honor and weal of his ancient kingdom, that the use of the dominion of New Scotland might arise to the benefit of that kingdom." Can anything be plainer than what was the intention of the crown and government by this broad and comprehensive bequest? Again, at the expense of repetition, we desire to point out that, in the preamble to the grants of James I., it is distinctly set forth that they were made for the purpose of promoting "the opulence, the prosperity,

and the peace" of the mother country and the colony. That monarch further speaks of the plantation of Nova Scotia, in his letters to the privy council of Scotland, as "a noble purpose whereby both the Baronets in particular, and the *whole nation generally*, would have honour and profit." Also his Majesty refers to it as a "great work, both for the good of the kingdom *in general*, and for the particular interest of every Baronet." The order of Baronets of Scotland was not then a mere honorary institution, but an hereditary estate—comprising, in fact, an hundred and fifty corporations-sole—having powers and functions greater even than those at any time exercised or enjoyed by the peerage; and the revival of the territorial rights and social objects of the Scottish Baronetage, is not only a Baronet's question—a question concerning the family rights and prerogatives of a handful of individuals—but it is a *Scottish question*, one which concerns the hearth-seat welfare, and domestic interests, of every subject of the Scottish crown, from Maiden Kirk to John O'Groat's House.

If the members of the Scottish Baronets have been guilty of great negligence, by allowing their chartered rights, and public functions as an hereditary body, to lie since the Peace of Paris in 1763, unexercised, so also have the people of Scotland at large been guilty of great national improvidence in the case. A combination of circumstances, however, such as society in the sister isles have never before witnessed, now present themselves for reviving the royal work of colonising New Scotland, and laying the foundations of a monarchical state there, in those humanities of virtue, wisdom, integrity, loyalty, and patriotism, which have made old Scotland glorious amongst the regal and imperial dynasties of Europe. It is now long since the remark was first made, that "systematic colonisation is a thing to be done, not to be talked about; an experiment to be practised, not a theory to be promulged." Within the last few years, at a multiplicity of public assemblies, the necessity for, and the policy of, an extensive regulated emigration, and an extensive methodical colonisation, have been explained and inculcated. The press, the pulpit, and the platform, have all, within the period of the last fifteen years, plied on these themes the most convincing rhetoric. They have likewise been the subject of manifold addresses to the throne—manifold petitions to both houses of parliament—manifold appeals to the nation at large. Both cogent, and loud, and long, have been the articles penned, the speeches spoken, and the arguments used, in or on this great and wide, but neglected domain of social enterprise. Is it needful, then, that we should further supplement what the wisest heads, the largest hearts, and the loftiest minds in the nation have exhausted? Let it be remembered, that the reasons to be assigned for immediate public attention to colonisation undertakings are results in operation. Problems not

they in the ideal regions of fancy or conjecture, but corollaries in masses of organised matter and moral existence. Facts great, mournful, overwhelming, terrific, have we to deal with; not merely laid up in sanitary reports, in poor-law commission proceedings, and in parliamentary investigations, but moving around and about us in the gaunt flesh and bone of millions of our fellow-creatures, whose unheeded sufferings, through long periods of political chicanery, railway speculation, and class self-aggrandisement seeking, have drawn down signal public judgments from on high. Is it true, as a heathen statesman observes, that "our country has not given us birth or educated us under her law, as if she expected no succour from us; or, that seeking to administer to our convenience only, she might afford a safe retreat for the indulgence of our case, or a peaceful asylum for our indolence, but that she might hold in pledge the various and most exalted powers of our mind, our genius, and our judgment, for her benefit, and that she might leave for our private use such portions only as might be spared for that purpose?" And shall our upper ranks in Christian Scotland be any longer indifferent to the following appeal:—"Now there is not really a grander or a kinder thought than what is called a scheme of *extended emigration*. To move and extend—to pursue the setting sun, and wear pathways across the ocean—to people desert shores—to wrest the first fruits of victory from rugged nature, and found great empires—this seems the glorious destiny of the British race. It is an instinct in our souls, it is developed in our nurseries, and in our schools. Every British child is taught that he has only nature, or the gentler savageness of uncivilised men to work upon, and he can easily obtain a single-handed triumph over the wilderness tribes. The opening genius of the schoolboy is nursed in the midst of dawning empires. From the deep springs of the great Eastern monarchies, he passes to the heroic beginnings of Grecian liberty and glory; and through the brilliant crowd of Ægean and Mediterranean colonies, he travels on to the wide foundations of Rome—to her early difficulties, her awful progress, her universal grandeur. Thence history takes up with him another tale, and out of the decay of Rome reproduces the conquerors and possessors of the world, amongst whom *he* stands. So noble, so soul-inspiring is this vision of history; and if hope, in which one hardly knows what is done, what remains to be done, and where the golden future is marked off from the glorious past, that we can never cease to wonder why *colonisation* is not with us the passion of the great as well as the necessity of the humble. Why do not our nobility themselves endeavour to surpass their Norman ancestors or predecessors in their titles, by substituting the conquests of peace for the conquests of war, by heading their countrymen across, not channels, but oceans, and adding new realms, not to the honours of one selfish

man, but to the uses of the human race? Everything is made to hand. Their armament is ready, and waiting. They enjoy, or should enjoy, such a position, such a hold on affection, on respect and obedience, so helpful a government, such openings, such facility of men and means, as no other aristocracy does, or ever did, or most probably ever will. Starving myriads wait the call of these illustrious chiefs. Did the rank and wealth of this country once lead the way, the many forms of poverty and dependence would follow, not so much willingly and readily as even without doubt or choice—mere shadows following their substance. Total banishment, and absolute surrender of home, wealth, and position, are not necessary, though they would have proportionate effect. But the sacrifice of a few years' income, a temporary absence from friends and equals, a mere sojourn on the edge of the wilderness, or even an occasional visit by the eight days' steamers, would establish and elevate thousands of their degraded countrymen, remove vast evils at home, create vast blessings abroad, and, what is worth taking into account at this time of day, would restore the faded lustre of rank, and answer the often-repeated question—*What is the use of the British aristocracy?*" *

Yes!—if these observations ought to sink deep into the hearts of the upper classes in England and Ireland, and produce good colonisation fruits, what ought they to do in Scotland, where one hundred and fifty titled heads of families have each a princely domain of sixteen thousand acres to recover and settle, and where society in general have a patrimony at stake of virgin soil twice the length and breadth of their native kingdom? If, with all these means and appliances at hand for *National Regeneration*, we go on upon the principle of "yet a little sleep, yet a little slumber, yet a little folding of the hands to sleep," then, assuredly, "poverty will come upon us (nationally) as one that travaileth, and want as an armed man." We have had our two famine visitations, and they have led to the adoption of no adequate plans of relief. Let us go on, as heretofore, to "rob the poor," to "oppress the afflicted in the gate," and not many years will elapse until, by another recurrence of potato-rot, of pestilence, and lucration-mania, "the Lord will plead their cause, and spoil the soul of those that spoiled them."

CASE OF THE BARONETS OF SCOTLAND AND NOVA SCOTIA.

QUESTIONS

Submitted for the opinion of M. D. Hill, Esq., Q. C., of the Common Law Bar, and T. C. Anstey, Esq., M.P., of the Equity Bar.

I.—What was the nature of the title, originally vested in the

* *Times*, 23d September 1844.

first Earl of Stirling and the Baronets created, from 1625 to 1638, by the royal charters of grant of lands in Nova Scotia?

II.—Whether the Baronets created between 1638 and 1707 had the same rights in Nova Scotia, as they would have had, if similar grants had been expressly made to them? or what was the extent of such rights?

III.—Is it competent for the crown to challenge such of the said rights, as are now vested in the representatives of the said baronets respectively, under any and what statutes of limitation or prescription? or on the pretence that homage has not been duly rendered? or on the ground of laches, non-user, or non-claim as against the crown, on the part of the present Baronets or their ancestors? And may not the wrongful acts or omissions of the crown's servants be replied to such challenge, as constituting, together with the troubled state of the times and territory, a sufficient justification of the alleged neglect?

IV.—Were the rights of the Baronets capable of being lost or destroyed by foreign conquest? If so, did the reconquest and cession of the territory, to which those rights attached, operate their merger in the crown by right of conquest, or revive them *jure postliminii* in the Baronets?

V.—What effect will it have on their claims, in respect of the said territory or its appurtenances, that the crown, without any hostile conquest previously made, has ceded the same to some foreign power?

VI. What effect upon their said claims will any subsequent grant have, made by the crown—with or without consideration—to others of its subjects?

VII.—Whether the Baronets have now any and what legal remedies or means for enforcing their said claims against the sovereign, in the event of their failing to obtain in any other manner the due satisfaction of them? And which of such remedies or means would it be more expedient for them to adopt?

VIII.—Would it be more advisable for each Baronet to proceed separately, in respect of his own claims, or for all the Baronets, or some, and which of them, to proceed conjointly?

OPINION.

We have considered the case and documentary evidence laid before us on the part of the baronets claiming dignities and lands in Nova Scotia, and we proceed to answer the questions in their order.

I.—We are of opinion that, by the several charters granted by King James the Sixth and Charles the First, under the Great Seal of Scotland, to Sir William Alexander, afterwards Earl of Stirling, that nobleman and his heirs became liege royal feudatories of

the lands in Nova Scotia and the adjacent American territories included in such charters, as immediate vassals of the Scottish crown, (Crag. Jus. Feudal., 76, 19;) and that by the same charters they were constituted the hereditary lieutenants or viceroys of Nova Scotia and such other territories, under the sovereigns of Scotland, for ever, with all the prerogatives and *jura regalia* of the Scottish crown in respect of the same, but subject to the feudal titles which, by the terms of royal charters, or by subinfeudations expressly granted under royal commission, were vested in the Baronets of Scotland and Nova Scotia created between the years 1625 and 1638. We are further of opinion that those Baronets, according to the terms of the charters or subinfeudations in question, became entitled to the same feudal and baronial rights, within their respective American baronies, as had been conferred upon the Earl of Stirling and his heirs in respect of the whole, and that they held their respective grants in free blanch farm, and as liege regal fiefs, immediately of the King of Scotland, and subject only to the homage and other reservations specified in their charters, and not subject to any other of the burthens or incidents of feudal tenure to which at that time all English feuds were subject, (Crag. Jus. Feud., 70, 5:—96, 31.) The delegated authority of hereditary lieutenant was exclusively vested in the Earl of Stirling and his line, and was essentially distinct from the character of crown vassal which they shared with the Baronets.

II.—We conceive that the Baronets of Scotland and Nova Scotia, created between 1638 and 1707, had the same equitable rights to baronies in Nova Scotia as they would have had if their charters had been made out. But—although the general words of the patents creating them Baronets, when taken in connexion with the regulating charter of the premier Baronet and the other charters and documents, constitute a sufficient obligation to bind the conscience of the sovereign—it is obvious that they were inoperative to confer such a title as could be enforced at law against third parties; and in this respect we think that the rights of the Baronets, created between those years, were not so extensive as those of the Baronets of previous creation.

III.—The only statutes of limitation or prescription, which can in any way relate to the case before us, are those of Scotland and her American dependencies. By the express letter of the charters, confirmed in the Scottish Parliament, and maintained, as it appears to us, by the Treaty and Act of Union with England, those dependencies are made parcel of the Scottish realm—and so effectually, that, even for the purpose of feudal investiture of land in Nova Scotia, sasine taken on the Castle-hill of Edinburgh is to be considered as having been taken in the land itself. We therefore think that no construction whatever can extend to the territories in question the statutes for limitation of actions or for prescription of

titles in England. But we are further of opinion, that those statutes have—properly or *per se*—no effect whatever beyond this realm, and that, in the absence of express enactment or local adoption, they do not extend to any of the transmarine dominions of her Majesty, (I Bl. Comm., Introd. s. 4.) They are strictly questions affecting the local remedy, and not questions upon the merits; proceeding *ad litis ordinationem*, and not *ad litis decisionem*, (Story; Conflict of Laws, first edition, pp. 482–3,) and belonging to the law of the forum; and as such, and not otherwise, binding on all mankind, whether aliens or liege subjects, plaintiffs or defendants, appellants or respondents, (Lopez *v.* Burslem, 4 Moo, Pr. C.C. 305.)

The Scottish enactments which bear on this subject are those of the years 1469 (Act 4), 1474 (Act 9), and 1617 (Act 12); by which, in certain cases, forty years' negative prescription bars the remedy, and forty years' positive prescription confers an indefeasible right. The first kind of prescription—which is very much of the nature of limitation of actions as understood in England—does not appear to us to constitute any bar to the recovery, by the present claimants, of their rights against the Crown. Negative prescription is given by those statutes, in actions between Subjects;—but the Crown is not named (Erskine; B. 3, tit. 7, s. 31). The positive prescription certainly—which is strictly analogous to prescription under English Law—does, by the express terms of the statute of 1617, run against the Crown. But there is no provision that it shall run in favour of the Crown;—and the preamble clearly shows, that relief to the subject and the vassal against an occasional grievance, and not advantage to the Sovereign or the superior, was intended by that statute. It recites the great prejudice which the King's lieges sustained, by the abstraction, concealment, and forgery of their evidences, in their minority and less age, and by the amission thereof, and by the injury of time, and the moving of pleas and actions against them thereon;—"which nevertheless, by the civil law and by the laws of all nations, are declared void and ineffectual." Therefore the king, "being willing to cut off all occasions of pleas and to put them in certainty of their heritage in all time coming," with the advice of the estates makes the enactment. In the following reign (Acts of Scottish Parliament, Car. I. [by Thomson,] vol. i., app. p. 223), it was declared by the King in Parliament that "he could not think that the act of prescription was at first intended for any prejudice of the Crown." Still less can it be thought—in the face of its own recitals—to have been intended for any prejudice of the subject.

We are, however, further of opinion that, if the statutes in question have any application to the case before us, the facts stated constitute a sufficient bar to any prescription. The long and frequent periods of disability cannot be computed; it being an uni-

versal rule, that "contra non valentem agere non currit prescriptio." We also think that the fruitlessness of preferring any claim—down to a very recent date—is so evident and so just a cause of forbearance,—with respect at least to such of the Baronies as were situate within the debated territories,—as in itself to amount to a sufficient interruption of the prescription. Independently of this, there are the specific interruptions, to which the Baronets appear from time to time to have had recourse, and there are also several instances stated of recognition by the Crown (Stair, D. Lauderdale, Dict., p. 11, 193; Fac. Coll. Macghie, Dict., p. 11, 112; and Prescription, app. n. 3). Assuming, however, that their rights would otherwise—either by positive prescription have been divested, or by negative presciption have been barred—under those statutes, we are still of opinion that, ever since the passing of the Act of the Convention of Estates, of the last day of July 1630, and the Act of Parliament of 1633 (Act 28), it has not been competent for the Crown to take advantage of either prescription, to the prejudice of the Baronets. By the first, (Acts of the Scottish Parliament [by Thomson] vol. v., app., p. 223), the order of Baronets was (together with the grants theretofore made of that dignity, and to which the grants of territory, contained in the same charters, were inseparately incident), "allowed, approved, and confirmed," in Parliament. By the second (Id., pp. 43-4), the several charters, letters patent, and infeftments, granted by King James the Sixth and Charles I. to Lord Stirling and the Baronets, and all instruments issued under that authority, were, together with the last-mentioned Act of Convention and the order of Baronets, ratified and approved and ordered to stand in force, according to their tenor, and as amply "as if the bodies of the saids letters patents, infeftments, and signatur abovementionat were heirin particularlie ingrost and exprest." To maintain the supposed plea of prescription, against the express letter of two successive enactments, appears to us impossible;—and the rather, since by the regulating charter, thus incorporated by express reference with the second and more solemn enactment, it is declared and ordained that every thing contained in it shall be valid for ever, against the Scottish Crown and all persons whomsoever, in all courts and places;—"notwithstanding whatsoever law, custom, prescription, practice, ordinance or constitution hitherto made, ordained or published, or hereafter at whatsoever time to be made, ordained, and published, or provided, and notwithstanding any other matter, cause or occasion whatsoever."

With respect to the local acts of limitation or prescription, we have first to observe, that they were enacted, not by the Hereditary Lieutenant and the Baronets nor with their consent, but by the several legislatures established, by George III., in the respective territories of Nova Scotia, New Brunswick, and Prince Edward's Island, subsequently to their final reconquest from the French.

But, independently of all question as to jurisdiction, we are of opinion, that none of the enactments of those legislatures were intended to obstruct the lieges in the recovery of their rights against the Sovereign. The Nova Scotia Act for quieting Protestant titles (33 Geo. III., c. 3), was limited expressly to claims made by or through the ancient French *habitants*, in impeachment of existing titles. The local Acts of the 21 Geo. III., c. 17, and the 32 Geo. III., c. 2, are the acts of limitation or prescription for the respective provinces of Prince Edward's Island and Nova Scotia. In those colonies, as well as in all the other colonies of North America, according to Mr Burge (III. Comm. on Colonial Laws, p. 96), "the prescription only bars the remedy, but does not confer a title on the possessor;" and its operation is expressly limited to "entries made," and "actions or suits at law or in equity had and maintained or brought;" words clearly insufficient to comprehend the appropriate remedies of grace and justice which the Crown adhibits to its suppliants. The Crown is named, neither in those statutes, nor in the English Limitation and Prescription Acts,—and, being virtually excluded by the descriptions used, can neither be prejudiced nor advantaged by such enactments (Year-book, 35 Henry VI., f. 62 a, and the Queen v. Tuchin, Lord Raym, p. 1066.)

We are therefore of opinion, that there are no statutes of limitation or prescription now in force, which at all affect the claims of the Baronets as against the Crown.

With regard to the long desuetude, into which the homage due to the Crown had been suffered to fall, we are of opinion that the claims of the Baronets are not thereby prejudiced. By the regulating charter, the Scottish Sovereign—for himself and his successors—expressly renounces and quit-claims all right, title, interest, claim of gift, petitory as well as promissory, and all action and instance competent, for nonpayment of duties, or nonperformance of due homage and articles of infeftment, or for whatsoever cause or occasion bypast; and he limits and defines the remedy, which the Crown shall have to compel homage in future. The land is to fall into notentry; in which case the Sovereign may enter and enjoy the profits; but, if the heir—within seven years from his next predecessor's decease—enters and does homage, he shall have back his lands, quitclaimed and freed of notentry, and as freely as if the notentry had not happened. We are clearly of opinion that, by the feudal laws of Scotland, the Crown would not, in any case of failure of homage, be entitled to more than the mesne profits of the lands, seized into the King's hands as having fallen into notentry (Crag. Jus. Feudal. 305, 24 and 25; 308, 2; 379, 2,) and that, even so restricted, the courts will make every possible intendment against a title so invidious (Id., 383, 17; 385, 20.) And we are further of opinion that,—as the Baronets have been restrained

from entering on their lands and rendering their homage, by circumstances over which the Crown had some control,—but themselves none,—and as they do not appear to have been guilty of any malicious or crass negligence in this particular,—the Crown has no right of notentry proper over their lands, but at the utmost only a right of ward (Crag. Jus. Feudal. 379, 4; 384, 18.) The lapse of time has been great, but it is fully accounted for. Nor do we think that any charge of laches, nonuser, or nonclaim can be set up, by the Crown, against the claims of the Baronets or their ancestors, to which the wrongful acts and defaults of the Crown's own servants, and the troubled state of the times and territory, will not afford a more satisfactory reply.

IV.—As between the Baronets and the Crown, we think that their rights were not capable of being so lost, or destroyed—by foreign conquest—as not to entitle them to seek, of the grace and justice of the Crown, the relief appropriate to their case. During the period of conquest, those rights would, in other respects, remain suspended or dormant. We see no reason for supposing that the whole of the American territory, granted by James VI. and Charles I., was ever ceded or conquered. But, whatever the extent of the conquered or ceded territory, we are clearly of opinion that, at every subsequent reconquest by—or retrocession to—the sovereigns of these realms, the suspended or dormant rights of the Baronets did not merge in the Crown by right of conquest, but did, immediately and in all their vigour, revive *jure postliminii* in the Baronets.

V.—By the laws of nations, as well as by the municipal laws of these realms, conquest and cession must concur, to enable the Sovereign to make a legal transfer—to a foreign power—of territory or territorial rights. The effect of any cession, made to a foreign power by the Sovereign and not preceded by a conquest, cannot in any case extinguish subsisting claims against the sovereign, but on the contrary becomes the matter of further claims on the part of such of the Baronets as are aggrieved by it.

VI.—We are, however, of opinion, that their claims may be to this extent affected, by subsequent territorial grants, made by the Crown—with or without consideration—to its own subjects,—that, if the Baronets aggrieved by such grants elect to follow the land,—instead of suing to the Crown for compensation,—they will be remitted to the *lex loci rei sitæ* and the ordinary remedies, for recovering over against the grantees; who, being private persons, will be enabled to prescribe, under either of the Scottish statutes of prescription, or to plead the local acts of limitation in bar of the demand, (Mostyn *v.* Fabrigas, Cowp. 161, 176. British Linen Co. *v.* Drummond, 10 B & Cr. 903. Ersk. Instit. B. 3, Tit. 7, s. 48.) But there is no doubt that—as against the Crown—the claims of the Baronets will not be affected by such second grants;—for, if

restitution of the land *in specie* is impossible, compensation in value may be had. (Year Book, H. 4, Hen. VII. f. 1, a pl. 1, & M. 9, Hen. IV. f. 4, pl. 17.)

VII.—We are of opinion that the Queen still possesses the feudal jurisdiction of her predecessors, Kings and Queens of Scotland, for determining the claims of the Baronets (Stair, B. 2, tit. 3, s. 2,) and that they must have recourse to that jurisdiction by petition. This they may do by petition of right to the Queen—in person or in parliament—(Waldeboef's case, 1 Rot. Parl. p. 160 *a*,) or else by petition to the Queen in Council. The form and process of either petition would, in any case, be regulated by the *lex fori*, that is to say, by the law of England, (Skinner's Co. *v.* the Irish Society, 1 M. & Cr. 165, 167, and "Proceedings, &c. before Lord Langdale, M. R." [11th, 12th, and 19th February 1838] in the same case, pp. 178–80, 219, and 870–1;)—and this is especially necessary in the present case, since, by the Union Acts, the Kingdoms and Parliaments of Scotland and England have merged into the United Kingdom and Parliament of Great Britain and Ireland, and the Privy Councils of Scotland and England into the Privy Council of Great Britain; and since the Queen is understood to rest Her present claim to the territories in question, upon a title accruing subsequently to the Scottish Union Act.

We are of opinion that, under all the circumstances of their case, petition of right is the more suitable course for the Baronets to adopt.

VIII.—We think it advisable that each of the Baronets should proceed separately, in respect of his own claims, or rather that some one of their body should so proceed, on being selected by the others for that purpose. The expense of a petition brought by a single Baronet will be less and the convenience greater; and the favourable event of one such petition will guide the decision of all.

M. D. HILL.
T. CHISHOLM ANSTEY.

Westminster Hall, 24th April 1847.

ON THE CLASSIFICATION OF SOILS WITH REFERENCE TO THEIR DRAINAGE.

By Mr W. BURNESS, London.

ALTHOUGH soils are diversified, almost to an indefinite extent, yet the whole may, appropriately, be divided into three classes, according to their draining qualities:—*First*, soils through which water percolates or flows, according to the laws of gravitation; *second*, soils in which capillary attraction counteracts that of gravitation; and *third*, where affinity counteracts both the other two, gravitation and capillary attraction

Soils of the first class may be said to be composed of an indefinite number of tubes, denominated percolating tubes, in opposition to those of the second class, commonly called capillary tubes. These tubes do not run parallel to one another, nor are they of equal diameters throughout their lengths, but are irregularly constructed of the shapeless fragments, so to speak, of the rocks of which the soil itself is, or rather was, originally composed, and therefore run in every direction, horizontally, vertically, or obliquely.

Soils of the second class are similarly formed of fragments of rocks, but in a more minute degree of subdivision than those forming the first. In both cases the tubes are the open spaces intervening between the irregularly shaped sides and angles of the fragments of rock. In principle they are the same as to direction and mechanical construction, but different as to size. It is the difference in their capacities which gives to each its distinguishing character.

Soils of the third class are also formed of the minutely divided particles of rocks like the second, but containing a large percentage of alumina in relation with other substances. They are generally denominated impervious clays, an expression strongly characteristic of their natural quality. Their particles, or atoms of which they are composed, have a greater affinity for water than capillary agency.

These three classes of soils have thus, therefore, something common in their formation—they are each composed of rocky particles, which not only point to their common origin, but, as it were, inseparably link them together as members of the same family. They are not only so from their original elements, but they are also more or less incorporated with vegetable matter, which also confers upon them very important qualities in a draining sense, of a common character—for, like alumina, decaying vegetable matter has a great affinity for water. Water not only enters into chemical combination with *such* organic matter in soils, but is also retained in its pores in opposition to the laws of gravitation and capillary attraction.

Again, soils of the first class not only contain small quantities of alumina, and other inorganic and saline substances having a strong affinity for water, along with a less or greater quantity of vegetable matter in a state of decomposition, but they are also less or more capillary of themselves; while capillary soils of the second class, again, from the quantity of decaying vegetable matter and alumina in them, are scarcely distinguishable from the third in many instances. Both extremes of capillary soils may be said to be lost in those of the others—the smallest percolating tube may be said to be the largest capillary one, from the increase of vegetable matter in it; while the smallest capillary tube, on the other extreme, ceases to be capillary from the increase of mineral substances left by evaporation in it, and the affinity of these, and of the matter of which it is itself formed, for water. The existence of such facts, however,

as these, forms no objection to their classification as above, but rather the reverse.

In draining, the object of the farmer, or agricultural engineer, is to reduce the different classes of soils to a common standard as much as possible. In further prosecuting this subject, we shall briefly notice each class separately, along with one or two examples, and conclude with a few observations on the duties of the engineer, to which we have just alluded.

I. *Pervious soils.*—The first class of soils is usually termed gravelly or sandy, and comprehends, perhaps, a greater variety of subspecies than either of the other two. A large extent of its breadth is naturally dry, either from the great depth of gravel and sand of which it is composed, or from being incumbent on some substrata, perhaps of no great thickness, but sufficient to remove any excess of water from it as fast as it falls, and to prevent any damage from being received from below. The major part, however, is the reverse, and requires draining.

Water, in this class, may rise to the surface, on the principle of seeking a common level with its fountain-head, so to speak; or it may burst out in springs or springy patches when intercepted by impervious strata, which prevent its perpendicular descent into the earth; or it may remain stagnant in hollows, like water standing in a cup or basin, never rising above a certain level when it finds a vent, and only sinking below it by evaporation.

Of all soils those of this class are the most easily drained, taking them as a whole. In ordinary cases, the principal points for consideration are, the materials of which the drains are to be constructed, whether broken stones or pipes, &c.—the depths at which they are to be placed in the soil—and the position of the field, or declivity of the soil, so as to determine their direction, dimensions, and distances between them. The first of these is generally settled from a previous knowledge of circumstances; while the position of the field, again, frequently determines the depth, as well as the direction, dimensions, and distances between drains.

A field, as to position, may either slope considerably, in which case it may be termed hilly, or it may be comparatively level. Let us briefly review either position, and in both suppose that pipes are the materials of which the drains are to be constructed.

1°. In draining hilly grounds, it has been generally concluded that drains should be taken directly up them—in other words, that the angle of inclination of the field is that also of the drains. The [illegible] exceptions from this rule are as follows:—

When water falls upon the surface, or springs from the bottom, in the middle of a ridge between two drains, and does not flow to either of them at right angles to the line of their direction, but obliquely through the pores of the soil. The line of direction of percolating tube will be the resultant of two forces, the one

acting in the line or direction of the drain, and the other at right angles to it. The first of these forces will be as the size of the angle of inclination, and the second as the depth of the drain. Hence, in a few instances, when the length of the percolating tube exceeds the breadth of the ridge, it may be advisable to have recourse to leading or main drains directly up the declivity, with branch drains across it, so to speak. The practice, however, will depend as much upon the subsoil as the inclination of the surface, which, although percolating, may be very various.

In determining the other points, the following two simple propositions will give the rule for each:—

First. The angle of inclination of a drain must always be less than the angle of drainage, and the size of the angle of inclination than the depth of the drain—radius being equal to half the breadth of the ridge or distance between the drains.

In the above theorem we have called the horizontal angle, which the resultant or percolating tube makes with the drain, the angle of drainage, and on hilly grounds it will readily be perceived that drains require to be placed at greater depths in the soil, and at less distances between them, than upon those of less inclination.

Second. The diameter of the pipe will require to be inversely as the angle of inclination of the drain.

The discharge of water into the drain from the soil and by percolating tubes, and its discharge again from it, are two very nice and rather controversial points for discussion, and no less extensive both practically and theoretically. On both, however, we shall observe brevity, in the strictest sense of the word.

First. Percolation of water through the soil. We have already said that the direction of percolating tubes is both horizontal and vertical. If we take a section of a ridge, with a drain in its centre—say four feet in depth from the surface—and if we farther suppose that one row of horizontal tubes are capable of discharging the whole of the water which descends from the vertical ones, then the following will be the theory of the removal of surface water, and the result produced by the drain.

When a drop of rain falls upon the surface of the ground, it adheres to the particles of the soil by the attraction of adhesion, until a second drop, in the majority of cases, falls upon it. If the weight or gravity of the two overbalance the attraction of adhesion, they will move perpendicularly in the direction of the next particles of soil forming the percolating tube, with a velocity equal to the difference between the attraction of adhesion and that of gravitation—and for the most part this velocity will not be accelerated, but, on the contrary, retarded; for the porosity of the soil generally decreases as the water descends into it, leaving out of consideration the velocity of the drops of rain when they first reached its surface, and the partial capillarity of all soils of this class.

In examples of this kind, the greatest effects will be produced—almost the whole ridge being drained to the depth of the drains, in this case four feet.

If, however, we suppose that one row of horizontal tubes are insufficient to discharge the water from the vertical ones, but that the whole of them which touch the pipe are required, then the result will be different—the soil will be drained to a less depth. If we, again, farther suppose that even the whole number reaching the pipe is insufficient, and that the water rises in the soil so as to exert a pressure, results will still be more unfavourable. Such hypothesis as this last, however, cannot be admitted into sound practice, and, in point of fact, on the majority of soils of this class, cannot exist; for, if we take the number of the percolating tubes touching the drains, they will be found much larger in capacity than the capacity of the drain itself, and, consequently, capable of discharging more water—so that, when water is thus found standing in one drain, it is occasioned either by the smallness of the pipe or drain, or the too great distance between them.

Second. The discharge of water from drains of equal diameters will be as the square roots of the *series* of their respective angles of incidence or inclination. Upon the truth of this simple theorem is involved the important question of deep and shallow draining, currently speaking. It will readily be perceived that, according to it, two drains, of equal diameters and angles of inclination, but placed at different depths in the soil—say the one at the depth of four feet, and the other at that of two and a half, will discharge equal quantities of water: a conclusion which, although self-evident almost, is nevertheless opposed to many current opinions on the subject, especially in this country.

Many of the advocates of deep draining, in their theories, aver that drains or pipes, of equal diameter, but placed at different depths in the soil, will discharge different quantities of water; that those at the greatest depth will discharge the greatest quantity, the angles of inclination being equal, and hence admit of greater distances between them. Too much reliance, however, we believe, is here placed upon the well-known proposition in hydraulics—'That the quantities of water discharged in equal times, by equal orifices, are nearly as the square roots of the heights of the respective heads of water above the centres of the orifices"—for they base their conclusion entirely upon the hypothesis, that we have a column of water, eighteen inches in depth, acting upon the drain at the depth of four feet, which we have not in that at the depth of only two and a half. Now, in theory, such a hypothesis as this is opposed to every sound principle, connected with the science of draining, as we have already noticed; while, in practice itself, *it is not draining* but damming, or the making of a pond or pool, or a lake in [illegible] in order to effect a small saving in the expense of

pipes, than which scarcely anything can be more "penny wise and pound foolish."

Independent, however, of the above view of the question, there can be no such thing as a column of water acting upon the water in the drain, so as to increase its velocity, until once the pipes, of which it is constructed, are running full bore. Previous to this, instead of accelerating the velocity, and hence the discharge, the effect produced by the water falling into the drain from a higher altitude rather retards the motion of the interior volume; while in many cases, if not in the majority in practice, by the time the drain is running full bore, its velocity will be sufficient to counteract or balance the effect of a column of water, eighteen inches of altitude, acting from without. Hence the reason why we see so often, during rainy weather in winter, water flowing upon the surface towards the bottoms of fields improperly drained, either when the drains have been put in at too great distance from each other, or where the diameter of the pipes is too small, or where both these blunders have been committed.

2°. Level fields.—The principal amount of what we have just said on hilly lands is applicable to these under this head also, so that little remains to be added. Drains will admit of being placed at greater distances between them; but, on the other hand, they will not discharge the same or equal quantities of water in equal times. The great difficulty experienced generally is to get the drains to a proper depth, and to discharge themselves afterwards, so as to dry *the whole of the soil to this depth*. This is the object sought, but not always the object obtained, from the want of attention to the rules given under last head, which are also applicable in this. In level soils, it may justly be said that drains should never run full bore, so to speak. Whenever a pipe is full, it ought to be discharged into a main drain, or else the size of the pipe ought to be increased towards the bottom of the field, so as to contain all the water easily which falls upon the ridge during the greatest flood.

The practice of draining with pipes of equal diameters is, in any case, unsound, even in soils of considerable inclination. If, with two-inch-bore pipes, the distance between the main drains crossing the field and emptying them is one hundred yards, a great waste of piping is sustained; for, at the highest extreme, the diameter of the pipe is either too large, or else, at the lowest, it is too small. In practice, both evils are generally experienced; for, instead of two-inch pipes, one and a half are used. If a two-inch bore is required at the one extreme, one-inch will suit the other, and one-and-a-half the mean or middle distance. In draining with broken stone, the same rule is to be observed. It is of much more importance, both in point of utility and economy, than perhaps is generally imagined, or, at all events, attended to.

In draining level soils, again, the drains or pipes should not run parallel to the surface, as in the case of those lying at considerable angles. If it is possible to get main drains eighteen inches below the others, let fifteen inches, or five-sixths of the difference of depth, be taken the advantage of, so as to give a declivity of this amount to the parallel or common drains. This will not only enable these to discharge more water, but it will also be the means of keeping them from being silted up, which they are very liable to do.

II. *Capillary soils.*—These are commonly called dead-sands and sandy clays, with other different provincial names, according to the quantity of vegetable matter which they contain. What is popularly denominated clay is frequently, however, not *alumina*, but any earthy substance reduced to a fine impalpable powder, imbibing moisture to a degree unfavourable to vegetation, unless, perhaps to certain classes of plants, such as rushes.

They form an extensive class, comprehending a great many varieties. Sometimes they are of considerable depth, as well as breadth, bringing up water to the surface from a great distance. At other times, they are only of a few feet in thickness, incumbent on rock, which supplies them with water. Sometimes, again, they are composed of drifted materials, incumbent on impervious clays, or open, porous, and gravelly soils, from which they obtain no water: but having in themselves many hollows and cavities, with their seams of gravel or sand widely interspersed through them, which admit and contain water, they are thus, although wanting a bottom supply, nevertheless, often very wet soils during winter and spring, and sometimes through the whole season. Again, where the clays of some geological formations terminate and become mixed with one another, large fields sometimes are to be found; while in others, almost the whole of the clays of which they are composed are capillary, with but few exceptions.

It is very difficult to drain them properly in the majority of cases—in a few instances, perhaps, more so than the impervious clays of the next class. A drain placed in them has no active power of itself to produce an effect. It is merely a passive instrument, possessing no power of drawing or sucking water into it, and thus removing it from such soils; *while they, on the contrary, possess this power of drinking water out of it*, so to speak, if any is flowing through it. All the water which capillary tubes do bring to the surface, may be said to be brought out of drains and reservoirs naturally formed in the interior of the earth. To suppose the contrary, that drains, whether natural or artificial, would remove water from capillary soils, without any other co-operating agency, would be to suppose *that capillary attraction did not exist in practice*, but that it was another theoretical name for the attraction of gravitation—a hypothesis too gross to be entertained. Neither, in the practice ... theory of draining, is there any such thing as suc-

tion or drawing, although such has become very popular phraseology, for suction presupposes the existence of a vacuum in the soil, and the expulsion of air from the pipes or drains; but, instead of anything existing approximating to this, we have the theory of "air drains," or a freer admission of air into them pleaded.

Air and water are simply fluids of different densities, and their percolation through the soil, together with their farther progress through the drains, is not an effect produced by the porosity of the soil itself and the capacity of the drain, but by the attraction of the earth upon them towards its centre. For a similar reason, instead of the indurated clay, of which the pipes of the drain are composed, and the particles of soil, exercising any sucking influence, so as to draw water into them and discharge it again—like a fish in breathing, so to speak—they obviously produce the opposite effect. They both, to a certain extent, retain water by affinity and adhesion, as already noticed, as well as capillary attraction.

It is very evident, therefore, that the capillarity of such soils will remain in an active state, until counteracted by some agent very different from that of a drain. Water can only be removed from the capillary tubes of this class of soils by evaporation, by chemical combination, and by the roots of plants. The latter two are objects sought by the drainer, and therefore we shall only, in this place, discuss the former.

The principal source of heat, by which the soil can be drained or dried by evaporation, is the sun; and the intensity of this heat will always be directly as the angle of incidence which his rays make with the surface of the earth. The effect produced, therefore, will be different in different latitudes: it will be greater in the southern counties of England than in those of the north of Scotland.

The angle of incidence, however, is not only different in different latitudes, but it is also different in every individual province. In a country like Britain, so diversified with hill and vale, and undulating grounds inclining to every point of the compass, there is a difference in the effects produced by the heat of the sun upon almost every field, however uniform in quality its soil may be.

The effects produced will also depend upon the amount of evaporation arising from the soil itself. If evaporation is great, the heat of the sun will be spent in rectifying this vapour, and the caloric, which otherwise would have penetrated the soil, warming and drying it, will now ascend into the atmosphere, and be there wasted in the clouds, so to speak. The soil will thus remain cold and unfavourable to vegetation.

The amount of vapour, again, which will arise from two fields will always depend upon the supply of bottom water which capillary tubes have, as well as the amount of their own capillarity. Water is more abundant in hilly districts than in the champaign

country, whatever may be the geological character of their soils otherwise. The one may be as wet during winter as the other; but as the season advances, and the showers begin to fall less frequently, the supply in the one case will cease long before it will in the other, and, consequently, the wetness of the champaign country will be subdued by the influence of the sun before that of the other.

In farther pursuing this head, we shall illustrate these conclusions, which we have just advanced, by a few examples from practice, embracing different kinds of capillary soils which have come under our notice, during the last thirty years, in different parts of England, Scotland, and Ireland, as these will show, more clearly perhaps than they have done, the obstacles to be encountered in different latitudes and situations, as well as the necessary steps to be taken by the drainer in draining them, especially to those acquainted with practice.

1°. Strathmore, Scotland. Soil a gravelly but wet clay, composed of drifted material, but little diversified in capillarity; and as to situation and exposure, rather lying high, and sloping on every side, so to speak, at a considerable angle. It was new land, and, when first broken up, furrow draining was not introduced, and but little under-draining of any kind was then thought of. It was drained upon the principle of deep furrows and narrow ridges. In 1826, a year remarkable for its drought, the heat of the sun at midsummer did not penetrate the soil, when directly exposed to his rays at noon, more than eighteen inches.

2°. On a field of dead sandy clay, almost adjoining the last, but which, unlike to it, required a large outlay for draining, no effect was produced below the depth of the plough furrow over the greater part of it; while, in some places, the dark moist colour was only removed from the surface over the tops of the drains at midday. Along these, a narrow white or light-coloured stripe, of from a foot to a foot and a half in breadth, was to be seen; but on either side all was dark and wet. During winter, the whole of the field was so wet and soft as to render carting upon it impracticable, unless during frosty weather, even twenty years subsequent to the time at which it was reclaimed from a quagmire.

This field was comparatively level, and also very diversified as to capillarity. It was full of what were provincially termed "*piping* springs." We have frequently seen water spring up within a yard of ruble drains filled eighteen inches deep with stones, and at the depth of three feet, and flow upon the surface during winter, until it came right over the top of the drain, when it disappeared—a plain proof of the passive instrumentality of drains, already noticed. During summer, although it was always easy to observe the wet spots occasioned by such pipes, it was sometimes difficult to bring a branch drain direct to the pipe itself, where it had [illegible] made its appearance above ground.

In both these examples, drains were as easily opened during summer as during winter; and in the second field, the former period was generally preferred when the crops admitted, as when in grass.

3°. During summer 1842, we superintended and examined a considerable extent of draining in Ross-shire, and the adjoining counties of Cromarty and Inverness. In one district of the former, which was hilly in the extreme, the soil belonging to this class was a wet sandy clay incumbent on shale, and not very tenacious. It bore a close resemblance to the more clayey portion of the last example, and, like it, was full of "piping springs." It was, however, very unlevel as a whole. One field or part was situated on one hill-side fronting the south, a second on another fronting the north, a third on another exposed to the east and south-east, while the fourth was the valley lying between them, and which was literally a quagmire, until some open ditches were cut at that period through it. The bottom supply of water was such, that each part was alike impervious to the influence of the sun at midsummer. Ditches and drains were more easily cut at this season than they were in the month of March. The drains were filled with stones, but produced no effect beyond the soil immediately resting upon them, as in the last example, and the open ditches as little.

On the northern shores of the Cromarty Firth there is a large extent of clayey soils belonging to this class, producing excellent crops of wheat from superior but expensive management, and where the effects of the sun are almost entirely counteracted by their capillarity and the abundant supply of water from the hills, which almost overhang them, as it were. On one large field—rather an exception, being incumbent on the inferior oolite—the supply of water is such as to render it unproductive in an agricultural sense. It is lying in pasture, producing the most worthless herbage.

Among many of the Highland glens, again, through which we have travelled, we have met with clayey spots on which the sun seldom shines, to assist the drainer to dry them. From the Pentland Firth to the Clyde, along the whole of the western shores of the mainland, as well as among the Orcadian, Shetland, and Hebridean Isles, the influence of the sun is remarkably little on such soils, whatever may be their exposure to his rays—the whole, almost, is left for art and the labours of the drainer to perform in drying them.

4°. During the years 1843 and 1844, we superintended the draining and trenching of upwards of sixty acres of diversified soil for his grace the Duke of Manchester, in his grace's demesne at Tandragee. About the one-half of this quantity was a capillary clay, incumbent upon shale and wacke, with an abundant supply of bottom water. The grounds were very unlevel, inclining to every

point of the compass, and generally under old grass. At midsummer, the heat of the sun had little impression upon them, and, instead of being rent in fissures, those exposed to the north were scarcely hard enough to carry the horses and carts in carting stones for the drains during the months of May and June, without cutting to a state almost impassable. The drains in this part were twelve feet apart, and at the depth of thirty inches. The main drains were at the depth of three, four, and up to eight feet. The trenching was twenty inches deep, the top spit being thrown to the bottom of the trench, with the grassy side undermost. Prior to trenching, no draining effect was produced upon the soil, alike by drains at different depths; for two feet from the edge of those of the depth of eight feet, was as wet as two feet from the edge of those at the depth of only two and a half,—a plain proof of the inefficacy of deep drains on soils of this class.

5°. During February and March 1843, one small portion was drained, but not trenched. It had a southern exposure, and formed a portion of two small fields subdivided by a large open ditch. This ditch we converted into a main under-drain, deepening it in some parts to the depth of ten feet—in others, to that of four, five, and six—so as to gain a proper declivity. The portion on the one side was in grass, and had previously been drained imperfectly; the other was divided into two lots—the one under green crop, while the other was being ploughed up for oats. With the exception of one small spot, of something less than an acre, upon the former of these two lots, both were gravelly soils, the major part of which did not require draining. The exception we drained, and laid the whole three lots down under grass into one field, leaving the trenching and finishing of the draining until the whole was broke up from grass together. No effect was produced by those drains, either by the large main drain or by the small ones. At Lady-day 1845, when we came to his grace's property in England, the soil was as sour and capillary as it was in 1843. Owing to the moistness of the climate, the influence of the sun never penetrated below the depth of the plough furrow on any part of it.

We have examined other demesnes and estates, not only in different counties of the province of Ulster, but also in that of Leinster; and although we found the heat of the sun producing various degrees of effect, according to the climate of the district and its exposure to the sun, yet not materially different from those we have mentioned at Tandragee Castle, in the county of Armagh. Over the whole of Ireland which we have seen, there is an abundant supply of bottom water, which soils of this class always bring to the surface at all periods of the year,—the principal source, no [illegible] of her moist climate.

[illegible] Kimbolton Park, Huntingdonshire, in [illegible] *luxuriantly over the tops of drains*

four and five feet in depth from the surface,—a plain proof that such lands were not drained by drains at that depth. The abundance of rushes in the park, and their willingness to grow on many parts of the park farm, as well as other plants of similar habits, were very interesting topics to us at first, inviting our attention for inquiry.

Nine-tenths of the grounds formed a complete exception from the "cold clays of Huntingdon," which we expected to find, and were composed of drifted materials of the oolite and conterminous systems, in many places being almost wholly chalk. We had many opportunities of examining the soil to various depths, from chalk-pits, ponds, ditches, and drains. The following two are most to the point for the object under discussion.

Adjoining the dog-kennel, which was surrounded by rushes, a well was dug for a pump, for the accommodation of the park-keeper. At the depth of some 6 to 8 feet, (we speak from memory,) a bed of sand was cut, and a copious supply of water obtained for about nine months. From two to three months, during the latter part of summer, it went dry. Below this sand-bed there was an impervious blue clay; but above it a capillary clay, of a fawn yellow colour.

To the north and west of the pump the grounds were considerably elevated. Upon this elevated side, and about 50 yards from the pump, a large pond had previously been dug, for the purpose of supplying the farm offices with water. Its bottom was considerably above the level of the surface of the ground at the pump, but probably at no great distance from the sand-bed which supplied the pump with water, judging from the dip of the sand-bed when the well was being dug. Be that as it may, the digging of the well and the draining of the sand-bed below the pond had no effect upon the intervening clay, so favourable for the growth of rushes, so as to effect the quantity of water in it. Water here ascended, feeding the rushes and changing the colour of the soil; but it would not descend, according to some theories of deep draining, for the sand here was obviously a natural drain, and equally effective with any which art could construct.

7°. The effects produced by the heat of the sun on this class of soils at Kimbolton was very diversified, both from their expansive quality and supply of water. In some places the ground was rent to the depth of *five feet*, in others to not more than *two*, both equally exposed to the sun; while in the woods, again, little impression was made. In all cases wherever they approximate closest to the quality of the soils of the next class, the fissures were the deepest; while, on the other extreme, where they were gravelly, or almost solely composed of chalk, very few cracks were to be seen. In some southerly exposed situations, again, where there was a redundant supply of water from sand-beds below all the year over, little effect was produced.

During the years 1845, 1846, and 1847, we had occasion to visit and examine a considerable extent of the adjoining counties of Bedford and Northampton, and, since that period, a large extent of the southern counties of England, in all of which we found similar results to those we have just mentioned for Huntingdon. In Northamptonshire, for instance, we found capillary soils incumbent on the inferior oolite, suffering both the extremes of wet and drought during the respective seasons of winter and summer—a very different result from that experienced by those in Ross-shire, where they were drowned all the year over, so to speak, from their contiguity to mountains. In Bedfordshire, again, we found a liberal supply of water brought to the surface by dead sandy clays, at the driest season of the year, as also in Essex, Middlesex, Bucks, and Berks.

8°. In the foregoing examples we have been passing over one species of soil belonging to this class, and confining our remarks almost exclusively to those not changed from their original state by natural causes, while very important changes of this kind are continually taking place in nature. We have already noticed the family relation between the different classes, and the effects produced upon them by vegetable and mineral changes. In many cases the quantity of vegetable matter increases to such an amount in percolating soils as to render them highly capillary; while, in others, capillary soils, from an increase of mineral substances, become impervious to the farther progress of water through them: for water raised by capillary action almost always contains salts of some kind or other in solution, which are not removed by evaporation. And as these have a greater affinity and attraction for the element of the soil and water, than capillary agency, it necessarily fixes a limit to capillarity, conferring upon the soil itself a change of character: it not only becomes capable, in the former case, of drinking copiously up from the bottom—a power which it previously but very partially possessed, if at all—but also of imbibing water from the atmosphere; and, when showers fall during summer, has the power of storing them up, so to speak, for its future wants: while in the latter case the reverse of these qualifications are produced. We shall, in this example, embrace the first of these changes—the second belongs to the next head.

In Ross-shire, adjoining the large field of capillary clay incumbent on the inferior oolite, already noticed, there is one of the above species. It is what is commonly called a rich but close damp garden soil, from 2 to 6 feet in depth, in some parts lying on clay, in others on different kinds of rock, either oolite, sandstone, or shale. Although very fertile, it is, nevertheless, generally speaking, very wet, discharging from its surface, during midsummer, a large amount of evaporation—but not nearly so much as the inferior clay [illegible] beside it, yet much more than is conducive to health and the

highest degree of fertility. In some places its capillarity decreases towards the surface, owing to its mineralogical construction, while in others it increases from an increase of vegetable matter. In some places the former, (ten years ago,) was beginning to produce rushes, in consequence of its having lain for some considerable time in grass. The latter was the most fertile, although we think the reverse had been the case originally, and was still capable of being rendered so by art.

We have met with, and might instance, many similar examples, in almost every county in Scotland, and also those of England which we have visited, but it is unnecessary. In Ireland their extent is much greater than it is in the United Kingdom.

From these examples it will readily be perceived that our previous deductions are amply verified in practice; while we have the important fact introduced to our notice, that all the richest soils in the kingdom have had their capillarity increased by their growing fertility when in a natural state,—a fact which brings us to this conclusion, *that capillarity of itself is not an evil*, but the reverse.

The reduction of the capillarity of soils, therefore, cannot be the grand object which the drainer has in view in draining them. In nine cases out of ten, it will be found that an excess of water is not obtained through capillary channels, but through percolating ones or springs. In examples 2°, 3°, and 8°, water was brought to within a few feet of the surface by rock-springs, and porous subsoil; and in many parts of example 4°, also, the main drains of the depth of 4, 6, and 8 feet reached the rock, where an immense quantity of water was obtained. In example 6°, again, the supply was obtained from beds of sand. In all cases of this kind, the rule is to cut off the superfluous bottom supply with drains, to the depth of the beds or change of substrata, if practicable. This practice, however, must not be confounded in theory with the draining of capillary soils, for, in practice itself, it is the draining of *percolating* subsoils. In the majority of cases, however, it is impossible to reduce such a rule to practice, and even if it were, it would not produce any favourable result upon the soil beyond a certain depth; for in examples 1°, 5°, and the greater extent of example 4°, and many parts of 3°, the quantity of water brought to the surface was insufficient to supply the wants of a cultivated crop. The only valid charge of demerit brought against the capillarity of soils, or that can be brought against it, is the bringing from the subsoil to the surface salts injurious to the surface.

The theory of impregnating the soil with pernicious salts, by capillary action and evaporation, naturally suggests the counter theory of washing it so as to effect its purification.

If a piece of clay or earth contain any soluble salts injurious to vegetation,—dry it, and then put it into pure water, which, when

poured off, will remove a portion of these pernicious salts in solution, so that its sourness and tenacity will be diminished every time the experiment is made.

The simple theory embraced in this experiment is just what we reduced to practice at Tandragee, by draining and trenching, example 4°. No benefits were obtained until both were executed, but afterwards very important results were produced. Every shower of rain as it fell, and was discharged through the drains, carried with it a portion of the poisonous salts, thus purifying the soil.

No doubt caution is necessary to be observed in turning up some subsoils to the surface, but that is no reason why an enemy so prejudicial to the interest of the farmer should be allowed to lie a few inches from the surface undisturbed,—nay, yearly increasing in strength. The more dangerous such enemies are, the more summary should be the means adopted for their conquest and removal. With the extension of chemical knowledge, many groundless apprehensions still existing on that point will be dissipated—which are based, doubtless, on past experience, when draining did not accompany trenching; or where the one or the other, or both, were improperly executed, so as to carry out properly the theory of washing and purifying.

The same theory of washing soils is reduced to practice by draining and subsoiling, or even by simply draining such as are subsequently cracked by the influence of the sun, but not with the same prospect of success, especially on those of the second and third classes, for the success of washing the soil in a great measure depends upon the proper drying of it, and the despatch with which heavy showers are removed through it when they fall. Now the soil can never be so thoroughly dried in the case of subsoiling as in that of trenching, while in many cases it cannot be dried at all beyond a few inches below the surface; nor can the showers be removed with the same speed and efficacy in the former as in the latter.

In many cases, again, in those counties where any benefit is derived from cracking, showers frequently fall no faster in autumn than they are imbibed by the soil; so that, by the time the drains begin to flow, the cracks are filled up and the ground restored to its original state. Early and heavy showers, therefore, are the most effective, as they wash out any salts from the cracks, and thus prevent them from readily adhering together.

II. *Impervious soils.*—The London and plastic clays of the tertiary strata, and the Wealden and Oxford clays of the secondary strata are examples of the clays of this class, and perhaps one of the most prominent members of it. Impervious clays, however, are to be found belonging to every formation, and in every county in the kingdom. Soils again, otherwise capillary belong

to this class, from the quantity of other minerals (besides alumina) which they possess, having a great affinity for water—such as lime, vegetable matter, and salts acquired from the subsoil—which render them in many cases equally if not more impervious than the purer clays, in some cases almost in their original purity at 6 inches below the surface. Unsound soils of this class are frequently the offspring of capillarity, being effected by the spurious salts brought to the surface at an early period of their history, when they belonged to the second class.

It is the imperviousness of the soils of this class which causes them to be placed over the arches of cellars or vaults exposed to surface water, and also over porous substrata, and in the centre of embankments in the construction of reservoirs and canals, to prevent percolation or capillarity, and the escape of water from them; as also over drains taken under *mill-lades* in drying low-lying fields, &c., adjoining. "Puddles" of this kind may be formed either naturally or artificially. If water is admitted, for instance, to dry clay, in sufficient quantity and for a sufficient length of time, the two will form a puddle as impervious as any which art could manufacture from the same materials. Hence the reason why soils of this description, although baked like bricks, comparatively speaking, during summer, soon return to their original plastic and semi-fluid state, so to speak, during winter, when they again acquire their maximum supply of water. The tenacity of clays again may be increased by drying them, and then working them with a solution of alum or any of the salts of lime.

In an agricultural sense, they are much warmer than the soils of the second class, especially during spring, autumn, and winter, and in the majority of cases also during summer. This is the natural consequence of the want of capillarity, and evaporation from their surface. When deficient of lime, or where their elements are not properly proportioned, so as to encourage the growth of plants, they are frequently found barren in the extreme; but when otherwise, as they generally are, they are also invariably richer, producing better crops, whether in grass or under aration, but especially under grass, than those of the second. Did the former equal the latter in capillarity, or even possess it in any degree, the conclusion is obvious, that they had been in a state of productiveness very different from what they generally are at present, long before this period. They are not, however, impoverished by their impregnation with salts brought to the surface from the subsoil, but by the annual removal of their crops, and the consequences which this subjects them to. Hence the possibility, on the other hand, experienced of putting such soils into a high state of fertility, although in many instances at a great expense, and of keeping them up to it by the application of a quantity of manure equivalent to the annual loss sustained. On

the second class of soils it may justly be said to be impossible to reduce this theory successfully to practice: for a sacrifice must be made in many cases subversive of practice itself ultimately.

Towards the surface they are generally rendered slightly capillary by the labours of the husbandman, or the quantity of vegetable matter in them in a fresh and undecomposed state, but seldom to such a degree as to enable them to part with what water they contain without cracking. One atom of water does not follow another in their ascent from the bottom, each taking the place of the other as the highest is removed from the surface or from the mouth of the capillary tube by the heat of the sun; but, on the contrary, the moment that the surface begins to dry, that moment they begin to crack. They consequently crack to a much greater depth than those of the second class, but, like them, according to their exposure to the sun in amount.

In 1847 we had occasion to visit daily a large cut of considerable length, and of various depths from 2 to 16 feet, while being opened through lands belonging to this class, while at Kimbolton, about the commencement of harvest. In one part of a field under old pasture, the soil was cut to the depth of 10 feet, while in another part of the same field, less exposed to the sun, to the depth of only 3. There was no difference in the quality of the soil on the two parts, further than the effect produced by the oxygen of the atmosphere, in changing the colour of the one to the depth of 10 feet, and that of the other to the depth of only 3, indicated. On another part, again, but still more back-lying than the last, the cracks only penetrated to the depth of 2 feet, and, where shaded with timber, to not more than one.

The cracks are also more apt to close and become impervious to the passage of water through them to tile drains, than in the case of capillary soils. During winter 1845 and 1846, about 50 acres, principally of this class of soils, were drained at Kimbolton. Previous to the opening of the drains, pits were dug for the purpose of ascertaining if there was any difference in the quality of the subsoil, and in these the water stood to the level of the bottom of the top or sod spit, without being affected, in the slightest degree, by the drains when taken to within three feet of them on the impervious soils; while on the parts of drifted materials, the water did not maintain so high a level. Both, however, maintained their first level until the pits were filled up. In both parts, the soil [illegible] previously cracked to the depth of three and a half feet, the [illegible] at which the drains were placed. For the same reason, [illegible]ing and subsoiling are more difficult to be performed suc[illegible]ly, and also the soil above the drains are more liable to be [illegible]idated, especially [illegible] placed at a depth beyond the [illegible] of the sun.

[illegible] soils of this

class are subject to the same practice as those of the second in draining, which we need not repeat. Washing is expedient in order to reduce their tenacity, and qualify them for imbibing moisture from the atmosphere in a greater degree, by exposing a greater surface to its action, and also of retaining within them showers which fall during summer, as well as to part with them more freely to the rootlets of plants. In both cases, therefore, the object of the drainer is alike—to render the soil both percolating and capillary, by the operation of washing and the application of manures; and, in order to effect this, it must be thrown open, or into a porous state, by art and the influence of the sun, so that the air of the atmosphere, and heavy showers of rain, may circulate and filter freely through it. Hence the following may be given as a general theorem for both, that:—

The purification of the soil will be inversely as the times during which water is filtered through the greatest number and length of percolating tubes to the drain; but directly as the quantity of water discharged from the drains in a given time, other things being the same.

Hence, again, the theory of the depth at which drains ought to be placed, and the distances between them.

1. The depths at which drains ought to be placed in the soil, are directly as the effects to be produced by art and the influence of the sun.

2. The distances between drains should be inversely as the capillarity and imperviousness of soils to be drained, together with the angle of inclination of the drains.

The depths or diameters of the drains themselves will be determined by the rules already given relative to discharges.

III.—In conclusion, from the foregoing pages, it will readily be perceived that the duties of the agricultural engineer are many, arduous, and important; and that this is not more true in a practical sense than in a scientific; for although but little of his time can be spent in the office, nevertheless it must appear obvious that there is much more science required in draining than, we are afraid, is altogether compatible with past experience.

If a field is rectangular, its soil belonging to the first class or percolating, its surface a plane, the work is no doubt simple, and but little science, comparatively speaking, is required. If the soil, again, belongs to the second or third class, and the engineer a stranger to the district, there may be some difficulty experienced in acquiring the necessary information, as to what benefits are to be derived from the influence of the sun, especially on that of the former. On the latter, the colour of the subsoil will generally indicate how far cracks have penetrated during former seasons, but it is always better to ascertain important facts of this kind during summer itself, if possible. If, however, time will not admit of

this delay, his own judgment and that of the farmer must settle the question.

If, on the other hand, the surface of the field is not in one plane, which it seldom is, the labours of the engineer will be very different from those above noticed, and from which no abatement ought to be made whatever. There is nothing, perhaps, more at variance with the interests of all parties, whether landlord, tenant, or engineer himself, than the calculation of profits from a deduction from the amount of his labours in the practice of draining. Although fields may be rectangular, although water may flow in every furrow of them, from the one end of the ridge to the other, and although it may appear gratifying to the eye, superficially surveying the whole, to behold the drains taken right up every furrow, yet such practices form the sound or convincing arguments that the field ought thus to be drained; for, in such a case, if the field is undulating, the angles of drainage on each side of the common drains cannot be equal, hence the consequences. In all cases, the angles of drainage must be equal, and the main drains must be so directed that this can be accomplished. If the soil, again, is of the first class, and the angles of inclination of the drains equal, the depths at which they are placed, and the distances between them, must also be equal; but otherwise, equality cannot be the rule in practice, unless at a sacrifice almost incalculable. If the soil, on the other hand, is of the second and third class, difficulties multiply in a tenfold degree, so that the rules which we have already given must be the more rigidly observed and reduced to practice.

There are, perhaps, some "old school farmers" who may set down the above economy as a species of new-fangled theorising, which can never be entertained sane in the minds of the most speculative of our amateur agriculturists. To such we briefly reply, that it is the reverse of speculation; for it is just putting that value and importance *upon practice itself* which science demands of the old school farmer to observe. It is unquestionably the equal depths and distances of the old school, upon equal qualities of undulating soils, which is the visionary offspring of theoretical minds; for the putting in drains or pipes of equal diameters, at equal depths and distances, according to common practice, where the surface is undulating—and both vertical and horizontal angles, consequently, unequal—is not putting in equal drains at equal distances, and parallel to one another, because at the one extreme or side of the field a drain may be parallel to a straight line, discharging a given quantity of water; whereas, at the other, it may approximate to something like a section of a cone, a [illegible]le, or, as likely perhaps, to both—and only discharging something like half the above quantity of water. We were lately called upon, by one of the wealthiest landlords in the south of England, to give an opinion as to the propriety of draining the plastic clays of Hampshire and the Wealden clay of Sussex and Kent, according

to a theory which experience had sanctioned in the Western Highlands of Scotland! To come from the Western Highlands of Scotland with a thirty-inch theory, so to speak, reducing it to practice, on the old school system of equal depths and distances, or from the equally moist climate of Ireland—as from Tandragee—to the impervious clays of the south of England or of Huntingdonshire—cracking, in many instances, to the depth of ten feet, while, in others, to only two; or to go from the latter to the former; or even to sit at the fireside of Old England herself, if we may be allowed the expression, and prescribe for her own acres but one infallible theory, of some forty-eight inches, is not more absurd, in either the theory or practice of draining, than to affirm that the surface of the British Isles is parallel to the horizon. However opposed to abstract theory the minds of some may be, and its importance to practice, the unlevelness of the surface of the United Kingdom is a fact which even the plodding industry of the old school itself cannot very easily annihilate; and, therefore, it is but wisdom on our part to give credit to local realities of this kind, so long as they do exist upon the surface of our globe. Vertical angles are just of as much importance as horizontal ones in draining, and the services of the sun and rain as the labours of the drainer, in draining, purifying, and changing the character of the soil.

Of the propriety of deep draining, there cannot be a discordant voice in theory. In practice, the grand question is to get this result or reality effected. In Huntingdonshire, the clays which we found cracked to the depth of ten feet might be drained successfully to this depth by drains placed to that depth, and say at not more than twelve feet asunder. To place the drains, in this case, at a greater distance, in consequence of their being at greater depths, would be to sacrifice sound practice to erroneous theory. To make the distance between them twenty-four feet instead of twelve, would not only require the pipes to be of double size before they would discharge the increase of water, but the purification of the soil would be effected at a much greater expense, and, in many cases, not effected, when the drains might perhaps be useless and requiring to be renewed. In agriculture, the maxim must never be lost sight of, that "*time is money*." Drains are liable to many accidents, and if an effect is not produced immediately upon the soil, the investment of money in draining is a profitless speculation. Much more loss is sustained by the narrow-minded policy in draining, than by the more liberal practice, with, perhaps, double the expenditure in the outset.

On the soils, again, cracked to the depth of only two feet, it would be impossible, practically speaking, to drain them to the depth of ten feet throughout. To place drains, in this case, at the depth of four feet, would be as unwise policy as to place them in the soil cracked to the depth of ten feet, at the depth of only thirty

inches. The practice, in this case, is the latter depth, with narrow distances between them, so as effectually to drain and wash to the depth of two feet; for, as the influence of the sun and rain are joint agents in the performance of the work, it would, therefore, be useless to advance the practice of the one beyond that of any of the others.

The field in question was in old grass, and we should have placed the drains to the depth of thirty inches, as above stated, and nine feet asunder, turned the top sod *on its edge above the pipes* or drain, with its grassy side to the side of the cut, and trenched the whole two feet deep, turning the top spit to the bottom, with the grassy side undermost.

When the soil cracks to the depth of three feet, drains may be placed to the depth of three and a half feet, filling up the difference of depths above the drains with pervious materials, and so on for different depths; but, beyond four feet in depth, for common drains, on soils of the second and third class, the increase of expense will exceed the increase of profit. In all cases, soils may be drained to the depth of two feet, by placing the drains to the depth of thirty inches; by filling up the difference of depths above the drains with pervious materials, as noticed above; and by following up the work with trenching or subsoiling to the former depth, provided the drains are not too wide asunder.

Although we believe that the practice of trenching and subsoiling forms the most important branch in the art of draining, in the majority of provinces in the kingdom at least, yet our limits will not permit us to add farther on this point than to recommend a system of experiments, where the former is adopted, as a guide for future practice, getting, in all cases suspected of being unsound—or having a deleterious subsoil, a tough, green sod, with the grassy side undermost—to the bottom of the trench. The trenching up of grass lands is, no doubt, the sacrificing of a corn crop in the outset; but we have always, on such occasions, found our green crops, after trenching, of more value than corn crops previous. The grass crops after, where the lands were under permanent pasture previously, and again laid down to grass, as at Tandragee, bore still higher evidence in favour of trenching. Many of the sheep-walks of Scotland might be drained and trenched, and again laid down to grass, returning ample interest for the outlay.

THE FARMERS' NOTE-BOOK.—NO. XXVI.

... value of Oats, cut green,
... Prof. of Chemistry,

Royal Agricultural College, Cirencester.—It is now generally admitted, that it is more profitable to reap corn crops before they are fully ripe; but we still want a series of well-conducted experiments, made with a view to ascertain that state of ripeness of the different grain crops which is best calculated to secure the largest return of money to the farmer, and to detect a ready means by which the practical man will be enabled to recognise distinctly this desired state of ripeness—or, in other words, the best time for reaping his corn crops.

With respect to wheat reaped at various times, we possess a series of careful experiments, made by Mr John Hannam, which prove, in a satisfactory manner, that one period of their age is better than another for reaping wheat; and that the advantages, which result by reaping wheat before it is fully ripe, are very considerable, and, indeed, almost surprising, when we calculate the benefits following such a practice to the extent of ground under wheat culture in the kingdom. Mr Hannam's interesting experiments are recorded in the *Quarterly Journal of Agriculture*, (vol. xii., p. 22–37, and vol. xiii., p. 170–187,) and are well worth a perusal by any one who feels inclined to make a number of experiments with the other corn crops, in the direction which Mr Hannam first followed in his experiments with wheat. I am convinced that every one, who will devote the same degree of attention, zeal, and circumspection to a set of such experiments, as Mr Hannam has given to his on wheat, will not only gain the thanks of all interested in the progress of agriculture, but will also feel the satisfaction of having contributed their share to the increase of the wellbeing of the country—a duty which becomes daily more pressing, since the increase of the population, without a corresponding increase of food, is attended by many evils, which press heavily on the wealth of the country. The loss of grain incurred by the reaping of perfectly ripe grain, or by the shaking of the ripe plants by wind, is sometimes considerable; and if we add to this the unavoidable loss which we will have to suffer in carting and stacking fully ripe corn, I think we must be convinced that, on this account alone, corn should not be allowed to become fully ripe. But it is not enough to know that the only means to avoid the shaking effects of the wind, or the necessary manual operations, is to reap the crops before they are quite ripe; we likewise require to be informed what the best time is for reaping our generally cultivated corn crops, and how that time can be recognised by the degree of ripeness of the plants. The general rule which Mr Hannam laid down, with respect to wheat, appears to hold good with oats; for Mr Stephens, in his *Book of the Farm*, mentions an observation which he accidentally had occasion to make, which is in perfect accordance with Mr Hannam's experimental results. Mr Stephens observes, that he once cut down a patch of potato oats, to

obtain a more convenient access to the stack-yard in which the hay-stack was to be built. The oats were full-grown, quite green, but full in the ear. When threshed by the flail, the sample produced was a most beautifully silvery plump grain. The next year, Mr Stephens cut down a larger patch of potato oats in the same state; and this result, as well as those obtained in subsequent trials, were equally favourable as in the first instance. I am not aware that any experiments have been made with oats, with a view to ascertain their comparative money value, reaped at different periods of ripeness; and I may be allowed, therefore, to recommend the subject to the intelligent farmers of Scotland, as one of the greatest importance, well worth careful investigation. It is not my intention to report on experiments of my own on this subject; but as my attention has been directed to a subject closely connected with the one referred to, I could not help bringing to recollection the interesting experiments of Mr Hannam, and recommending them as a model for similar experiments.

In this paper I shall report on some experiments which I made, with a view to ascertain the relative nutritive value of oats cut down green and oats fully ripe, in as far as chemistry is justified to give an opinion on this point. My attention was first directed to investigate this matter by Mr James Walker of Glyn, by Larne, county Antrim, Ireland, who, during his residence at the Cape, had occasion to observe the excellent feeding properties of oat-hay, and whose experience of them has convinced him that oats cut green have better feeding properties than oats allowed to ripen; and that also the straw is better for converting into manure. In order to enable me to investigate how far the theoretical nutritive nature of oats, in the two mentioned stages of growth, corroborated Mr Walker's practical experience, this gentleman kindly supplied me with samples of potato-oats in straw, grown at Newport, Fifeshire, by Mr Alexander Russell. Sample No. I. was quite ripe, the ear and straw of bright yellow colour. No. II., on the contrary, quite green, but the ear fully formed, though still a little milky. Both samples were grown on sandy soil, upon the same field, of a uniform character, and cut at the same time, the green oats having been sown about a month later than the ripe sample.

I. *Oats fully ripe.*—In order to ascertain the water in the straw and grain, one plant was taken, and the straw and grain weighed separately. The straw of the whole plant, air dried, weighed 119·7 grains. It was dried in a waterbath until it ceased losing weight; [illegible] when perfectly dry the straw weighed 79·50 grains. The amount of water, therefore, in the straw was 33·58 per cent. The number of pickles of this plant was 100; the weight of which, with the husk, was 70·17 grains; when dried at 212° F., they weighed 53·[illegible] grains, and had lost, consequently, 24·18 per cent [illegible] the plant yielded 76·55 grains of straw, which was

dried in the waterbath, and left 43·42 grains of dry straw; and therefore contained 43·27 per cent of water. The number of pickles was 91, which weighed in the wet state 59·54 grains; when dry 48·88 grains: the amount of water in them, therefore, was 17·13 per cent.

II. *Oats cut green.*—One plant gave 92·16 grains of straw, air dried—perfectly dry, the straw weighed 42·46 grains. The amount of water in the straw, therefore, was 53·92 per cent. The same plant contained 64 pickles, which weighed 38·04 grains wet; dried at 212° F. till constant, the weight was 29·15 grains; percentage of water, 23·37. Another plant of the green unripe oats gave 212 grains of wet straw; when dried at 212° F. it weighed 100·30 grains, and had lost, therefore, 52·68 per cent of water. The number of pickles of the same plant was 100, which weighed, wet, 57·77 grains; when perfectly dry, the weight was 38·15 grains; they had lost, therefore, 33·96 per cent of water.

In the following table these results are put together, in order to facilitate their comparison with each other:—

No.	One Plant of Oats.	Weight of Straw.	Weight of Pickles.	No. of Pickles.	Proportion of Straw to Grain.	
					Straw.	Grain.
	OATS FULLY RIPE.					
		Grains.	Grains.			
1.	Wet, . . .	119.7	70.17	100	62.94	37.06
	Dried at 212° F. .	79.5	53.20	...	59.91	40.09
	Percentage of water,	33.58	24.18	...	...	...
2.	Wet, . . .	76.55	59.54	91	56.24	43.76
	Dried at 212° F., .	43.42	48.54	...	47.21	52.79
	Percentage of water,	43.27	17.13	...	...	...
	OATS CUT GREEN.					
3.	Wet, . . .	92.16	38.04	64	76.67	23.33
	Dried at 212° F., .	42.46	29.15	...	58.65	41.35
	Percentage of water,	53.92	23.37	...	...	...
4.	Wet, . . .	212.	57.77	100	78.58	21.42
	Dried at 212° F., .	100.3	38.15	...	72.22	27.78
	Percentage of water,	52.68	33.96	...	...	...

A glance at this table teaches us—

1. That the unripe oats are more succulent—that is to say, that the percentage of watery juices in the grain, and in particular in the straw of the green oats, is greater than that in the fully ripe oat-plant.

2. That the dry grain of the oats, cut green, is not so heavy as that of the fully ripe oats; 100 pickles of the fully ripe oats producing 53.2 grains of perfectly dry oats in one case, and 53.34 grains in the second (91 pickles giving 48.54 grains;) whilst 100 pickles of the green oats weighed only 45.54 grains according to the first experiment (64 pickles weighing 29.15 grains,) and only 38.96 grains according to the second experiment.

3. That the greater the produce of straw which the different plants furnished, and the more succulent it is, the smaller the produce of grain.

In No. 1, the straw of the whole plant weighed dry 79.5 grains, and contained 33.58 per cent of water; for 79.5 grains of dry straw we obtain 53.2 grains of dry grain, or for 100 of dry straw, 66.9 of dry grain.

No. 4 is a plant cut green, which produced 100.3 grains of dry straw, and contained 52.68 per cent of water; for 100.3 grains of dry straw we obtain only 38.15 grains of dry grain, or for 100 grains of dry straw, 38 grains of dry grain.

No. 2 produced 73.42 grains of dry straw, and contained 73.27 per cent of water; the produce of dry grain was 48.54 grains; for 100 grains of dry straw we obtain therefore 111.7 grains of seed.

No. 3, the plant cut green, gave 42.46 grains of dry straw, with 53.92 per cent of water, and 29.15 grains of dry seed; for 100 grains of dry straw we obtain therefore only 68.6 grains of dry seed.

Before I give the following details of these experiments, I may be allowed to make a few observations in reference to the most economical mode of using food for cattle, and to the nutritive value of articles of food in general.

Much remains to be acquired by us before we shall have arrived at anything like a rational knowledge of the process of nutrition; and though it cannot be denied that, during the last years, many persons have been engaged in investigating experimentally the relative nutritive value of articles of food, or in advancing theoretical speculations calculated to throw light on the imperfectly understood or rather still mysterious process of nutrition—all which endeavours were useful in so far as to disperse many erroneous views, and to establish many well-authenticated facts, in place of *floating* and often contradictory knowledge—yet we are bound to confess that, notwithstanding all that has been said and written on the relative value of articles of food, we are still far from that practical knowledge which teaches us how to make the [illegible] food—that is, how to obtain the best results with the greatest economy in food. Many of our theories are plausible, and [illegible] too, but nevertheless cannot be depended on, simply [illegible] they are not based on experience, and consequently do not [illegible] the real state of matters. Experience in this, as in so many

other things, should be our only guide, and no one ought to attempt to recommend a favourite theory of his own to practice—by praising certain modes of culture, or recommending certain articles of food, and certain practices in feeding cattle, &c.—before having an opportunity of testing his theoretical speculations by experience. I think if scientific men would always avail themselves of this *experimentum crucis*, for testing the correctness or falsity of their theoretical speculations, we would hear less of the disappointments of practical farmers, and fewer complaints of chemistry doing them no good; at all events, they would save themselves the trouble of writing, and the agricultural world the still more onerous task of reading, undigested favourite ideas, which, strange to say, are frequently prescribed in the shape of practical recommendations. On the other hand, I am convinced that practical men will remain in the dark on many of the most important points of agriculture, as long as they despise the aid of chemistry, and persist in solving inquiries connected with agriculture by mere blind experimentising—by experiments, I mean, made without plan or clearly-defined and distinctly-understood objects. If those engaged in such *random trials* would bear in mind that nature does not give a precise answer to an indistinct question; and if they would be candid enough to believe, in all cases in which an experiment has failed to fulfil their expectations, that the experiment itself, or the anticipated result, must be false in principle, and that consequently the fault is their own, and not on the part of nature—a great deal of good would be effected. Unfortunately, however, most men are as quick in condemning the value of the materials used in a bungled experiment, as they are eager to praise, and enthusiastic in recommending every result when the experiment proves favourable to their views; and when such an experimenter has some kind of theoretical notion in his head, with which the experiment happens to tally, the case is still worse. In this way a great deal of harm has been done, and the progress of scientific agriculture retarded instead of advanced; and I have no hesitation in saying, that such experiments are utterly worthless, and calculated to do harm instead of good. To make a good experiment is a far more difficult task than many are inclined to imagine; indeed, it is very difficult, and requires not alone a considerable amount of theoretical knowledge, but also much practical skill, patience, circumspection, caution, zeal, energy, modesty, and above all, sincerity—qualifications which happily are still to be found, but which are seldom so in the possession of one and the same individual. It is not knowledge alone which makes a good experimenter; nor is it practical skill alone, nor zeal and sincerity. If the first were as wise as Solomon, but with no candour, his experiments would not deserve any confidence, and hence would be worthless; and again, however

zealous and conscientious a man may be, if he have no knowledge, he will never make a good experiment. It is, therefore, not one or two of the enumerated qualifications, but the union of them all in one individual, which are calculated to make a good experimenter —a union, no doubt, of gifts which we but rarely meet with. There are few men of whom it can be said, that they are good farmers, good chemists, and good men, in one person; and I think that, generally speaking, it requires all the energy, zeal, and time of one man, to become either the first or the second, and to fulfil all the duties conscientiously of one particular calling, leaving the endeavour to become a good man out of consideration, as a duty incumbent on all men. However, this must not discourage us: the principles of division of labour are well understood in other professions, and I do not see why they should not find an application equally well in ours; and I am convinced, that in the course of a few years, we shall be in possession of a series of well conducted, well considered experiments, which cannot fail to benefit the practical husbandman, if chemists and agriculturists would unite together more closely than they have hitherto done in the endeavour to settle questions, which, considered by the chemist or agriculturist alone, will remain problems for ever, but which must yield to the united efforts of both, and cease to be unsatisfactory.

These few general remarks on experiments apply more in particular to experiments on feeding which have been already made; while other experiments are still required, on the principles now enforced, before we can form a rational idea of the relative nutritive value of articles of food. Our knowledge on this subject, as mentioned in the outset, is still in its infancy. It is true, we know that the substance of all articles of food does not consist of one element, or one simple combination; we all know that the substance of different kinds of food is exceedingly variable, and hence we infer, that it must be so. Let us take, as an example, milk—an article of food prepared by nature itself, of which we know that it is perfectly capable of supporting animal life by itself, when consumed in sufficient quantity by the animal. Cow's milk consists of the following substances:—

a. Nitrogenous organic substances, (casein and extractive matters.)

b. Organic substances free of nitrogen, (butter, milk, sugar, &c.)

c. Salts, (chloride of sodium, phosphates, &c.)

d. Water.

Now, the same substances we find in all sorts of milk—in the milk of the ass, goat, cat, dog, or any animal, we find the same substances. The qualitative composition of all sorts of animal milk is the same; but if we inquire after the quantitive composition of different kinds of milk, we soon find out a great difference in the relat[illegible]ion of the above-named substances. Thus we find,

in the milk of the cow, goat, and sheep, for 4.5 parts of nitrogenous substances, about 8 parts of non-nitrogenous substances. In the milk of the dog, on the contrary, we find, for 19 parts of substances containing nitrogen, 14.7 parts of non-nitrogenous materials. These differences, in the relative proportions of these two classes of bodies found in milk, cannot be accidental; and as milk alone is capable of supporting growing animals, we are justified in inferring, that the relative proportions of nitrogenous and non-nitrogenous substances in the food for full-grown animals must be a fixed proportion, different for every kind of animal. Our reasoning is supported by the fact, that animals which are quite tame when fed properly, get wild and unmanageable when too large a proportion of nitrogenous food is given to them; and that swift and active creatures get lazy and heavy when the food they consume contains too great an excess of non-nitrogenous food. The fact that there are so many fat bakers, no doubt, finds its explanation partly in the excess of amyleceous food consumed by them. That we cannot trespass, without impunity, the laws of nature, nobody can deny; and although I cannot share the opinion of some writers, who think that the Irish are lazy and apathetic because the great mass of the population of Ireland lives almost entirely on potatoes; and that the English are an active and energetic nation, on account of the beef and porter with which their table is supplied, I nevertheless believe in a certain connexion which exists between the food and the moral and physical constitution of man.

It is well known that no man, nor any animal, can exist without food containing nitrogen. It is impossible for any animal to live for any length of time on food which does not contain nitrogen, however great and varied the daily supply of such food may be. The proportion of the nitrogenous and the non-nitrogenous substances in many articles of food has likewise been determined, and their relative nutritive value been estimated according to the quantity of nitrogen they contain; but it is clear that the proportion of nitrogen which an organic compound may contain cannot be regarded as an absolute measure of its greater or smaller nutritive value, because the proportion of nitrogen is only one factor amongst other circumstances which ought to be taken into account, in judging the nutritive value of an article of food, and because a part of the nitrogen may exist in the food in a combination which is not at all fit to increase its nutritive value. Now, to this latter point I wish to draw particular attention, as it appears to me that it has hitherto been overlooked by many, or met with a consideration which evidently shows that no particular importance is attached to it. The form, I think, in which food should be presented to animals, is as essential as its composition; and if we take only the latter into consideration, in determining the nutritive value of any article

of food, we cannot be surprised if we arrive at conclusions contradicted by experience. However, the proportion of nitrogen may serve, in many cases, as an indication of the greater or lesser nutritive value; and if we have reason to believe that the nitrogen is contained in combinations which are analogous to casein—for instance, in albumen, fibrin, gluten, &c.—and if our comparison is restricted to different varieties of food belonging to one class of organised compounds, (*i.e.*, if we compare different root-crops with each other, or different grain crops, or leguminous seeds, &c., with each other,) we are justified in pronouncing those articles which contain the greatest proportion of these compounds the most nutritious. Another important point, in judging of the nutritive value, is to pay due regard to the influence of those constituent parts of food which are not assimilated by the animal organism, and consequently rejected with the fæces. The amount of nitrogen, therefore, at the best, can only be regarded as an indication in estimating the probable nutritive value of an article of food, but it never can represent the actual feeding quality. It is quite possible that one kind of food may contain just as much, or even a larger proportion of nitrogen than another, and nevertheless the latter be more nutritious. Amongst other reasons, one principal ground of this apparent anomaly is, perhaps, founded in the circumstance, that the first substance is so indigestible that the stomach of the animal cannot afford the time necessary for the complete digestion of that kind of food, and hence much of its nutritive matter will be rejected in the droppings of the animals fed upon it. Another kind of food, though perhaps not so rich in really nutritive matter, on account of its greater digestibility, is assimilated more readily by the animal organism: the droppings of the animals fed upon it will not contain particles of food, which have not undergone some change, for the food has fulfilled its purpose, and none of its nutritious elements have been lost. As an illustration of this, I may mention a case familiar to every farmer. Dry unbruised corn escapes frequently half-digested from the horse, in consequence of which a large amount of its nutritive matter is lost; but if the same food is presented in a less solid state, if the corn is first bruised, it is rendered more digestible: the whole of the nutritive matter has a chance of becoming assimilated, and the practical result is, that a smaller quantity of bruised corn goes a much further way than the unbruised. Instances of a similar nature occur frequently enough to practical men, but the consequences are seldom traced to their true causes; and thus it happens that an article of food is pronounced worthless, which, prepared in a judicious manner, or given along or mixed with other substances, might have proved a most valuable one.

I will not at present occupy the attention of the reader, by enumerating other influences which ought to be taken into account

we can give an opinion as to the nutritive value of an article d, because I think the few I have referred to will confirm my ion, that our knowledge on the process of nutrition is still in ancy, and that the determination of the nutritive value of an of food is not so easily found, but that it requires, on the ry, a thorough study into the nature of food and the vital sses—a study which cannot be successfully cultivated by a whose mind is prejudiced by a favourite or fashionable , but which will be rewarded by the happiest result, if pro- d with candour; while, at the same time, nature is chosen guide, and experience held as the only ground upon which justified in building theoretical speculations.

following nitrogen determinations were made, according to ethod of Dumas—a method which is described in works on ical chemistry, and is well calculated to secure accurate , provided certain precautions have been taken, which I can- umerate in this place.

I. *Oats fully ripe.*

Vhole grain.—1.253 grammes, dried at 200° C., gave 24.54 c. f moist nitrogen, at a temperature of 5°.6′ C. and 751.8. m.m. . Nitrogen, 2.39 = 14.92 of protein compounds.

.646 grammes gave 13.9 c. c.m. of moist nitrogen, at a rature of 12°.8′ C. and 756 m.m. barom. Percentage of en, 2.54 = 15.87 of protein compounds.

traw.—0.809 grammes of straw, dried at 100° C., gave 9.81 . of moist nitrogen, at a temperature of 17°.8′ C. and 765.3 barom. Percentage of nitrogen, 1.33 = 8.31 of protein unds.

.927 grammes produced 10.63 c. c. m. of nitrogen, at a tem- re of 14°.4′ C. and 761.2 m.m. barom. Percentage of nitro- .36 = 8.62 of protein compounds.

II. *Oats cut green.*

Vhole grain.—0.943 grammes, dried at 100° C. gave 22.9 c. oist nitrogen, at a temperature of 12°.2′ C. and 758.4 barom. tage of nitrogen, 2.87 = 17.93 of protein compounds.

.770 grammes gave 17.99 c. c.m. moist nitrogen, at a tem- re of 5° 3′ C. and 760 m.m. barom. Percentage of nitrogen, = 17.81 of protein compounds.

Straw.—1.125 grammes of dried straw produced 16.36 n. of moist nitrogen, at a temperature of 11°.1′ C. and m. m. barom. Percentage of nitrogen, 1.74 = 10.87 of compounds.

.749 grammes gave 11.43 c. c. m. of moist nitrogen, at a rature of 12°.2′ C. and 758.7 m. m. barom. Percentage of en, 1.80 = 11.25 of protein compounds.

These results, represented in a tabular form, admit of better comparison, thus:—

	RIPE OATS.		OATS CUT GREEN.	
	1st Experiment.	2d Experiment.	1st Experiment.	2d Experiment.
WHOLE GRAIN.				
Percentage of nitrogen, . .	2.39	2.54	2.87	2.85
equal to				
Protein compounds, . . .	14.92	15.87	17.93	17.81
STRAW DRIED AT 100 C.				
Percentage of nitrogen, . .	1.33	1.36	1.74	1.80
equal to				
Protein compounds, . .	8.31	8.62	10.87	11.25

This table shows that the straw of the unripe oats is considerably richer in those principles which serve to replace the waste of the muscular fibre, and that the grain of the unripe plant is likewise more nutritious. That the green straw should be more nutritive one might expect beforehand, but I was quite unprepared to find the proportion of protein compounds in the grain of the unripe plant larger than in the fully ripe, for which reason I repeated the analyses; and as I took care to avoid any source of error, I got nearly the same results in the second determination, and cannot, therefore, doubt the correctness of the analytical results.

These results I communicated to Mr Walker, asking him at the same time to favour me with a short account of his practical experience in the feeding qualities of oat-hay; and as I have no doubt that his observations will be interesting to many, I insert his answer in reply to my letter.

"GLYN, BY LARNE, COUNTY ANTRIM, *June* 2, 1849.

"I am made extremely happy in the receipt of your favour of 29th May, and trust your forthcoming paper will meet that attention from the agricultural world its importance and your treatment of the subject merit. When your paper gets into circulation, and practical men test the virtues of the food I recommend against a like quantity served and used as at present, experience will corroborate my assertion, as your present analyses so far do, 'that a very material saving is effected by cutting the oats intended for live stock while the straw is yet green, the ear being nevertheless fully formed though still milky, or nearly so.'

"My own experience at the Cape of Good Hope, (though confined to young horses,) leads me to assert, that oats thus reaped and cut into chaff, half-inch to inch length, will go one-fourth further than the same allowed to ripen, and used as in this country. I need

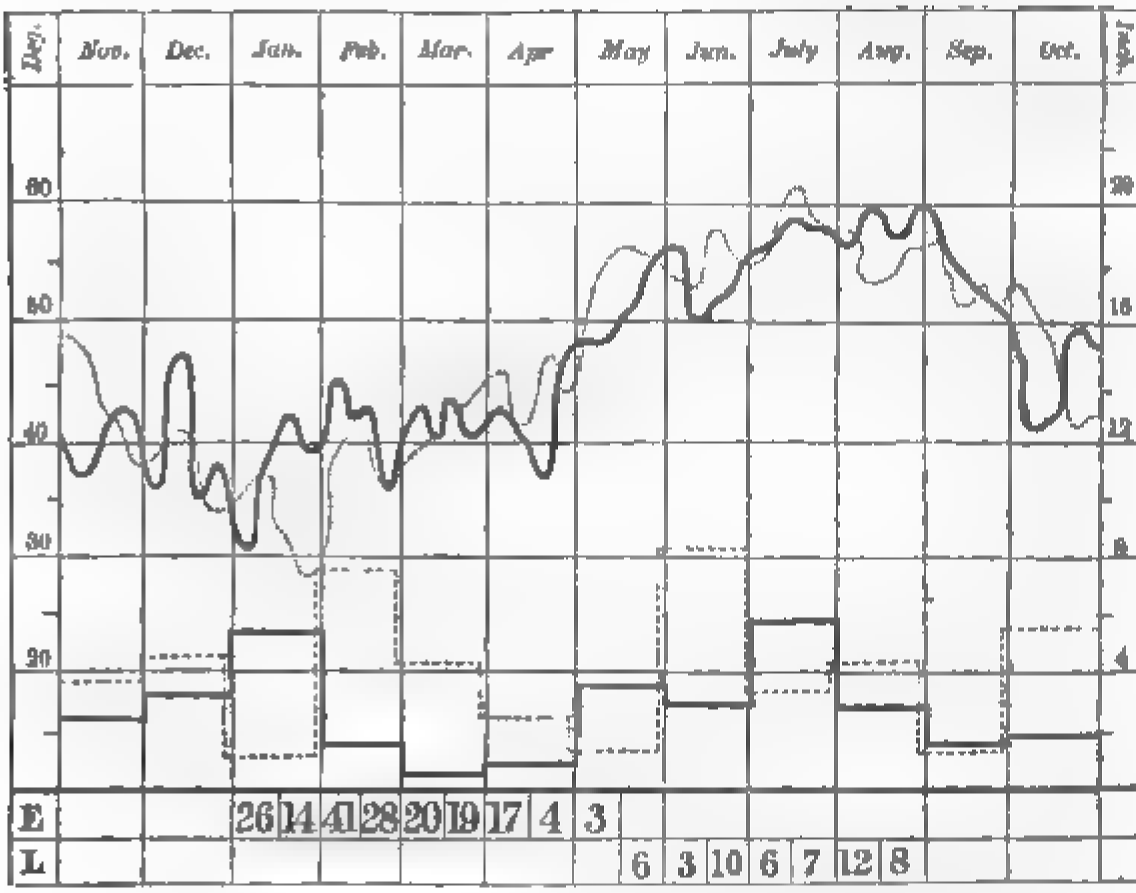
hardly allude to the evident saving of labour—saving of there being no risk of the best grain shaking out and being lost—the different appearance a manure-heap would have at this season for turnips, &c.,—all these will strike the intelligent husbandman, and induce a trial on different kinds of stock, which, I doubt not, will amply repay the attention you have devoted to my suggestion.

"James Walker."

Mr Walker's practical experience that oats cut green are highly nutritious, is in perfect accordance with Mr Stewart's of Glenormiston, who recommended oats to be cut green and used like hay, under the name of oat-hay, and who likewise found it to be an excellent food for horses. Some animals appear to be very fond of oat-hay: Mr Stewart informs us, in his paper, that his horses preferred this fodder to every other kind of hay. The practical experience of Mr Walker and of Mr Stewart finds its explanation in the analytical results given above, which show distinctly that, apart from all other advantages, which are in favour of oat-hay, the relative proportion of really nutritive matters in equal quantities of oats cut green, and oats fully ripe, is larger in the former than in the latter. I say apart from all other advantages, for there are several to which Mr Walker has hinted at in his letter; but I will only add a few remarks, before I conclude, to the very important one referring to the superiority of manure. It is not only the better appearance of the manure-heap which speaks in favour of the use of oat-hay, but the fact itself is a sure indication how thoroughly the food has been digested in the stomach of the animal. The reason why oat-hay is more readily and completely digested than fully ripe oats is obvious.

I have shown, in the above experiments, that oats cut green contain more watery juices than oats allowed to become fully ripe; in other words, oat-hay contains a larger proportion of soluble substances, which are readily digestible, but which substances become insoluble, and less readily digestible, when oats are allowed to ripen on the land. Again, we all know that the young shoots of many vegetables are found to be soft and eatable, and, like young roots, are readily digestible; but these shoots or the young roots become woody and indigestible, when allowed to grow for a couple of months longer. Animals which, fed upon the young shoots, will thrive very well, can scarcely maintain themselves on the more matured food; a great part of it becomes indigestible, and, when consumed by the animal, passes through the intestines in a great measure unchanged. The reason of this difference is, that the starch, gum, sugar, and other soluble and readily digestible substances, which we find in the young shoots of vegetables and roots, are partly rendered insoluble, and gradually changed into indigestible woody fibre, which substance increases with the age of the plant.

Thermometrographia for the Agricultural Season ending with October 1849.—From observations made at Annat Cottage, Perthshire, N. Lat. 55° 56′, Elevation 170 feet.



The *upper* dark line is laid down from the weekly averages of temperature in 1849, referring to the scale of degrees in the left hand column; the dotted line from those of the previous season. The *lower* dark line shows the monthly depth of rain in 1849, referring to the scale of inches in the right-hand column; the dotted line shows the fall of rain for the previous season.

The row of figures marked from E, extending from the beginning of January to the middle of May, shows how many days this season was *earlier* than 1848, in the early and latter parts of each included month. In the first part of February, the excess of earliness was about six weeks. These figures were derived from observations made on the dates at which wild flowers put forth their blossoms. From the middle of May onwards, the bypast season was *later* than the previous one, as indicated by the second row of figures marked from L.

Mean temperature of the vegetating season (March 20 to Oct. 20) in 1849=51·1 degrees; in 1848=52·5 degrees, in both cases much below the average.

Mean temperature for the twelve months ending with October 1849=46·75 degrees; do. do. October 1848=47·09 degrees; do. do. on an average of years=47·86 degrees.

Fall of rain, Nov. to Oct.=33·46 inches; do., previous season, [illegible]·00 inches; do. do. average of years, 27·93 inches.

Of the twelve months, nine were colder than usual. January, February and March were milder than usual; hence the earliness of the spring season.

December, January, May, June, July, and August had more, and the other six months less, than the average fall of rain.

Monthly barometrical averages, Nov. 29·450 inches—Dec. 29·377—Jan. 29·353—Feb. 29·626—March 29·642—April 29·383—May 29·662—June 29·636—July 29·532—Aug. 29·560—Sept. 29·711—Oct. 29.591.

The Subsoil. By J. TOWERS, M.R.E.A.S.—In substance, temperament, and combination, it is extremely various: that of the worst quality consists of an indurated *pan*, impenetrable by air, by water in any available quantity, and, as in the case of the natural concrete gravel—known as "*plum-pudding stone*"—by the common implements of agriculture. *Chalk* is a good subsoil, if not too deeply seated, effecting perfect drainage, and, by its retentive power, holding fast a quantity of water sufficient to maintain verdure during arid seasons, where clay-lands crack into open fissures. *Sandy* and *gravelly* subsoils are poor; but those which consist of *strong* clay may be easily converted into valuable and fertile land, by gradual laboration. To enable the reader to appreciate facts which are but little understood, and still less practically applied, I now refer to, and shall extract somewhat freely from, a valuable letter from C. Wren Hoskyns, Esq., addressed to the farmers of Herefordshire, in 1847. The writer alludes in no measured terms to the sort of prejudice which is too far entertained against *subsoils*—as substances inert, void of nutriment, incapable of sustaining a healthy vegetation, but frequently, on the contrary, promoting canker in trees, and discoloration in vegetables. "The notions," he says, "entertained about that mysteriously calumniated, ill-used, down-trodden thing—*the subsoil*—amount, in truth, almost to a national prejudice. So many causes have conspired to produce it—so many writers and speakers have increased it—that any one might justly fear to attack it, who had not personally proved it to be as utterly unsupported by experiment, as it is erroneous in theory."

The subsoil cannot, indeed, be neglected with impunity, if *de facto* it is *the repository*—*the storehouse*—of those salts, with alkaline or earthy bases, which lie concealed until disturbed by tillage. *Loams* are stated to contain *potash; green-sand*, coprolyths, and those *phosphoric* acid. Farmers cannot analyse subsoils: they are not in possession of available means of research; but if scientific chemistry be deserving of credence, such stores, of inappreciable value, now lie buried in the subsoils of their arable staple. In proof of what may be effected by deep tillage alone, Mr Hoskyns adduces the fact, that "in the Island of Madeira the vine is not a

native plant, and, after growing well for a few years, the fruit begins to degenerate, and makes inferior wine. The expense of new stocks—usually brought from the Hock vineyards of Germany—being very great, every expedient has been tried in order to postpone the evil as long as possible; but *no manuring*, or pruning, or attention, is of much avail; and the only remedy is found in extremely *deep cultivation*. I once saw the process. Nearly a score of labourers, hard at work, were standing in a long trench, deep as they were tall, stocking the earth from one side and throwing it on the other. On inquiry, they told me that they were trenching an *old vineyard* for fresh planting: *trenching nearly six feet deep!*

"Some months after, a merchant, in taking me over his wine-stores, pointed out, in some casks that were being broken up, a mineral incrustation about as thick as a half-crown, and as brittle as glass, which he called *tartrate of lime*, adding, that it was commonly deposited by the wine, especially when new. I afterwards ascertained that potash and soda existed in the deposit."

This incrustation that forms upon wine casks is crude tartar, that is, the acid salt of potash, with two proportionals of tartaric acid, known in commerce by the name of *argol*. Chemically, it is identical with cream of tartar, degraded by some impurities from the wine. The best argols come from Leghorn and Bologna. *Tartaric acid* is found in the juice of grapes, and, it is said, in that of tamarinds and mulberries. But it is the peculiar acid of the vine, wherein, after vinous fermentation, it always is found combined with potash, which alkali can only have been obtained from the *soil*; hence the interpretation of the singular process of deep trenching described by Mr Hoskyns. The *acid of tartar* is an organic product of the vine itself, and has been found to consist of

$$\left.\begin{array}{llll} 4 \text{ parts } \textit{carbon}, & \text{equivalent to} & 4+6 & = 24 \\ 2 \ \text{,, hydrogen}, & \text{,,} & & = 2 \\ 5 \ \text{,, oxygen}, & \text{,,} & 5+8 & = 40 \end{array}\right\} = 66, \text{ the atomic number.}$$

The attraction which exists between 2 proportionals of *potash* and 1 proportional of tartaric acid is a most interesting phenomenon: upon it and the natural result, argol or cream of tartar, depends the surpassing excellence of grape wines; and they who would effect good domestic wines from currants, gooseberries, &c., must introduce a due proportion of one or other of these bi-tartrates into their sweet must during fermentation, and also in the casks.

As deep tillage, by bringing up potash from beneath the exhausted surface-soil, restores the grape, so, by analogy, we claim the necessity of deep tillage everywhere. We read that the Flemings, those skilful and industrious men who have converted a sandy waste into rich and fertile land, "dig trenches about a foot deep over the field, from the bottom of which, assuming the soil to be 10 inches deep, they have therefore dug up 2 inches of subsoil;

THE TWEEDDALE PLOUGH

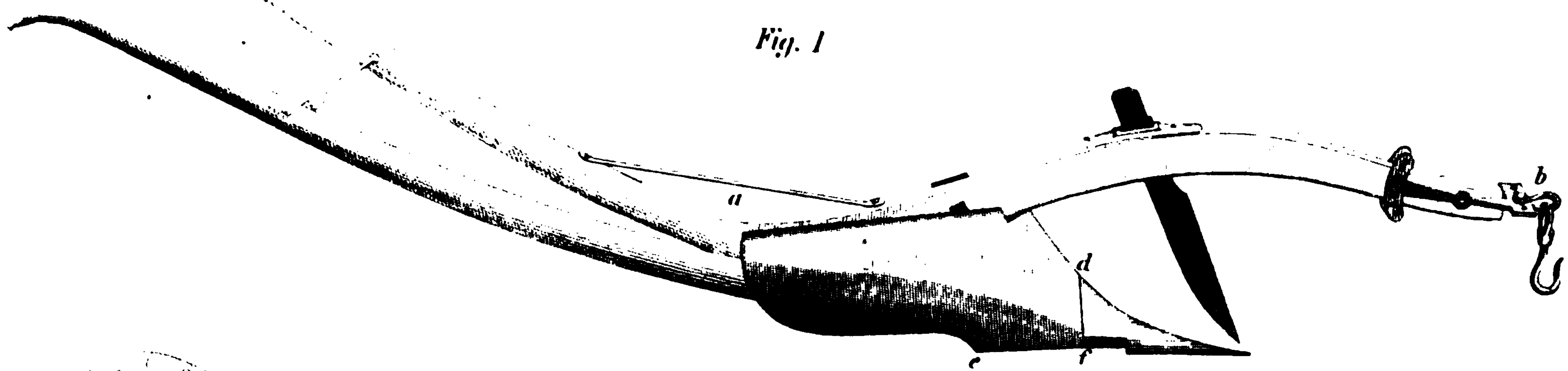


Fig. 1

THE SUBSOIL TRENCH PLOUGH

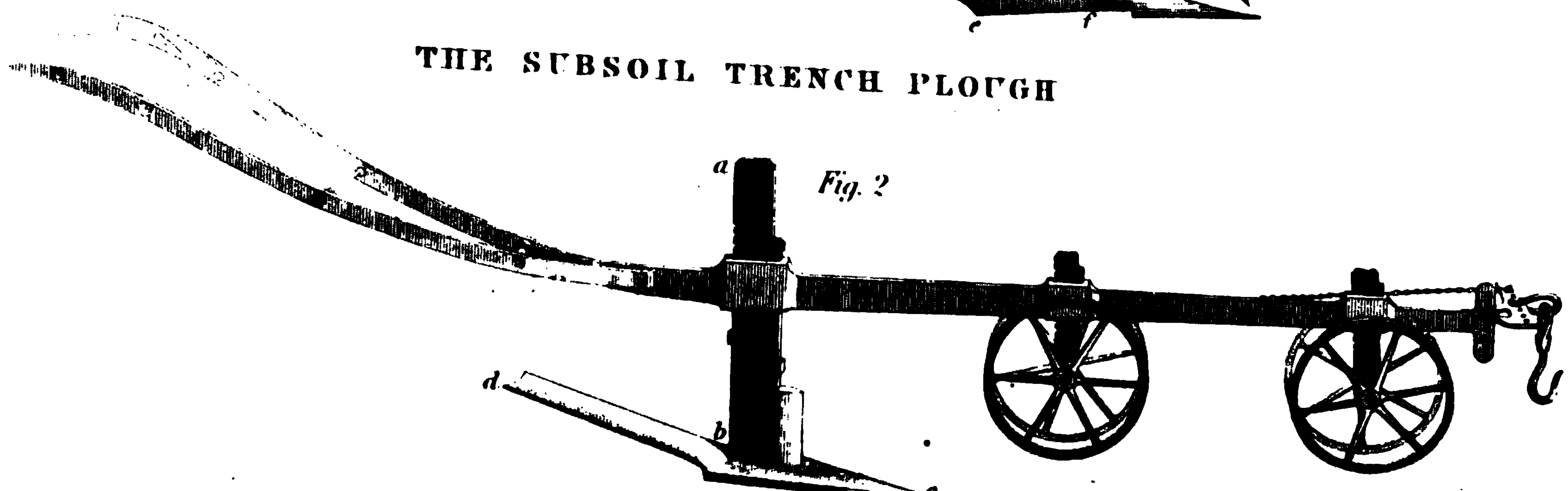


Fig. 2

THE YESTER PLOUGH

Fig. 4

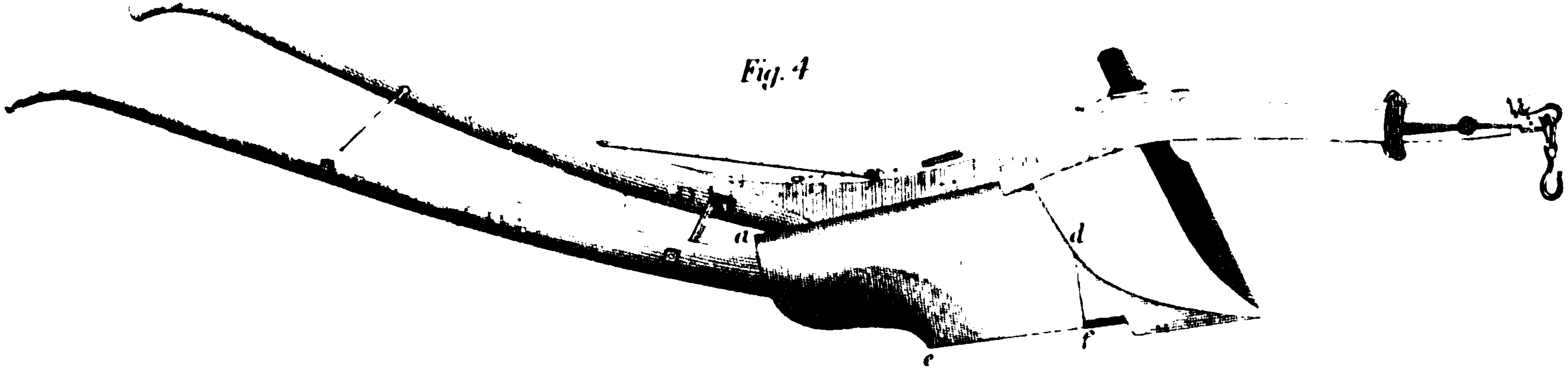
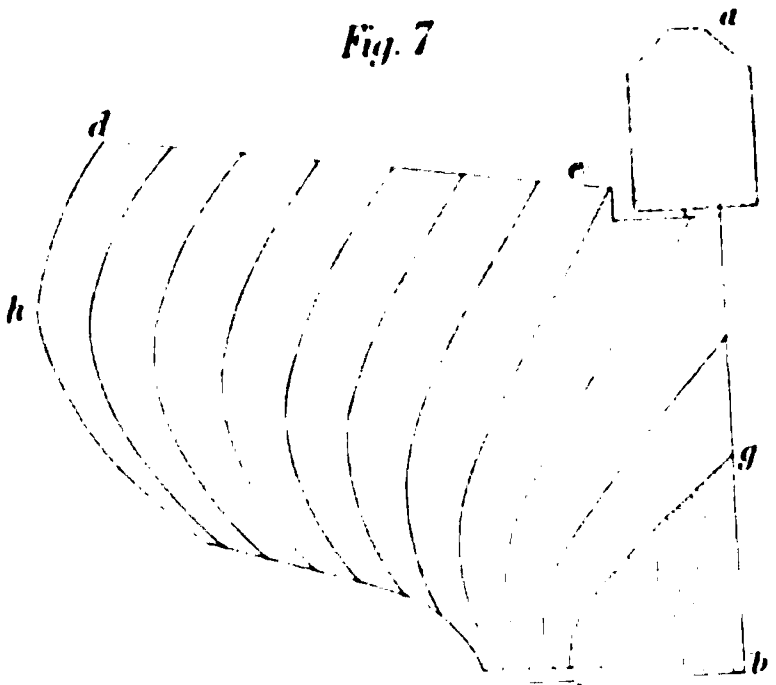
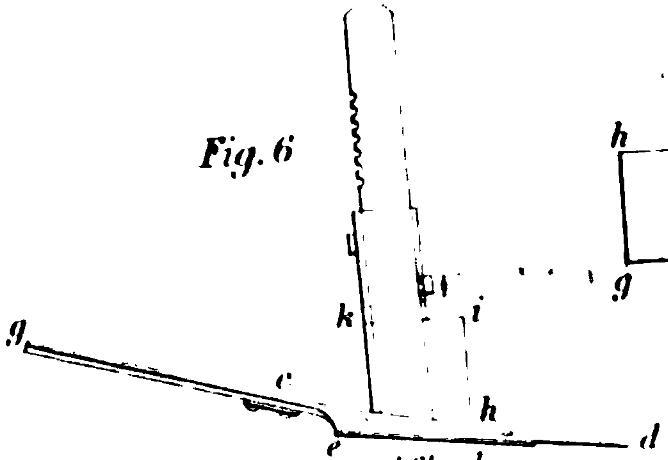


Fig. 7



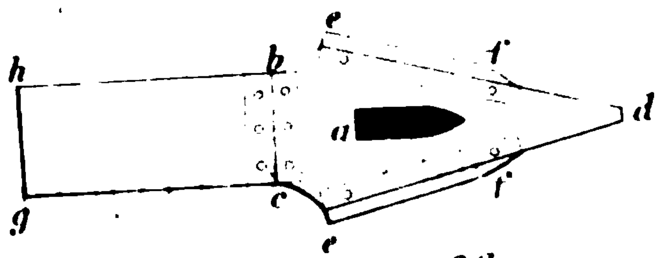
Series of Sectional lines of the Tweeddale Mould Board.

Fig. 6

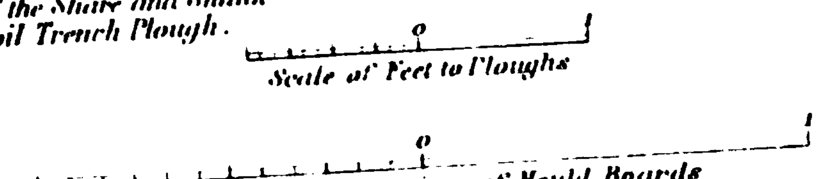


Elevation of the Share and Shank of the Subsoil Trench Plough.

Fig. 5



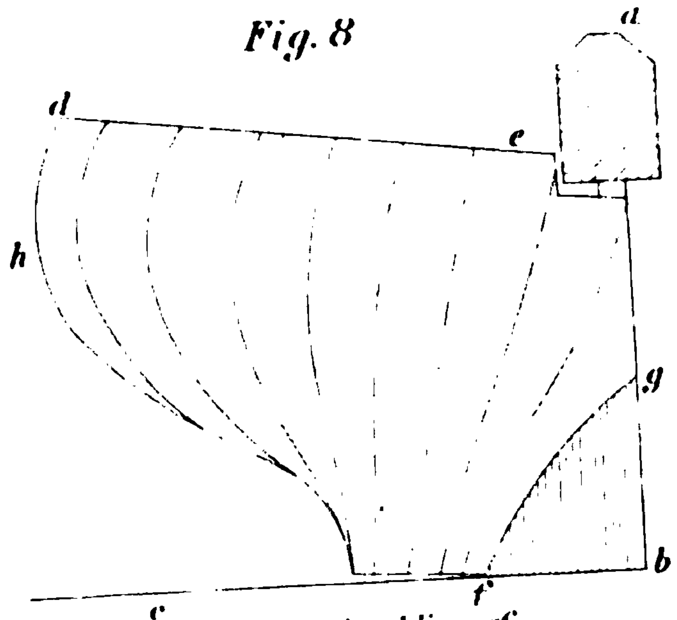
Plan of the Share of the Subsoil Trench Plough.



Scale of Feet to Ploughs

Scale of Feet to Sections of Mould Boards

Fig. 8



Series of Sectional lines of the Yester Mould Board.

and, as they proceed, they fling the whole over each land on which the seed has been previously sown, which they thus cover. The trench being shifted sideways each year, and the process renewed at the end of a certain number of years, 2 inches of the whole subsoil will have been mixed with the upper surface, and the soil deepened to that amount. The same process is then repeated 2 inches deeper. In this way, after four or five courses of trenching, the soil is brought to a depth of 18 or 20 inches of uniform quality. On one Flemish farm, of about 140 acres, the whole of one field of 106 acres had been repeatedly trenched to the depth of 2 or 3 feet." Our "skimming" operations defeat our best processes, and clearly prove (as has been elsewhere asserted) that however we may flatter ourselves as first-rate cultivators of the surface-soils, we are lamentably remiss in our appreciation and treatment of *the subsoil.*

DESCRIPTION OF PLOUGHS IMPROVED BY THE MARQUIS OF TWEEDDALE.

It has been known to agriculturists that the Marquis of Tweeddale has for many years followed, with remarkable success, a system of deep or trench ploughing. In his earlier experiments on this subject his lordship appears to have been contented with a moderately deep furrow; but as long ago as ten years he deemed nothing to be satisfactory under a depth of ten inches, and extending to fourteen inches: thus penetrating what is usually held to be the subsoil, and not only penetrating but turning it up, and mixing it with the upper soil. The early success of the system having been so satisfactory, it has been gradually extended to a general practice on his lordship's home farms, of trenching-up the subsoil with the happiest effects.

Previous to the Marquis's return from India, he had employed only the common plough, or at least one slightly different from Small's original form of mould-board and body; and, it is believed, seldom if ever used the subsoil plough. On his return to this country, and seeing the striking success of his own plan, which, notwithstanding his absence, had been sedulously conducted agreeably to his instructions, he resolved not only to continue, but to extend still further the practice that had already done so much good. With these intentions, and having heard of the improvement which Mr Slight had effected on the four-wheel subsoil plough of Read, his lordship ordered one, that he might have a trial of its effects in the system that he had thus far matured.

Read's improved subsoil plough, being intended to work with only two horses, did not come up to the expectations of his lordship in respect to depth of furrow; but the ease with which it was managed, and the efficiency of the work, so far as it went, were

so satisfactory, that his inventive faculty was immediately put in requisition, and the rudiment of the Tweeddale subsoil trench plough was speedily brought into form by the addition of a new member to the original; which member, in order to retain a uniformity of nomenclature in that class of implements, we propose to designate the tail-board, or elevator, if the term should be better liked.

It should be kept in remembrance that his lordship's leading idea, in this his system of ploughing, is to work *deep*, and, in doing so, also to produce a certain amount of intermixture of the surface and the subsoils; portions of the latter being actually brought to, or near the surface, while like portions of the surface-soil are allowed to drop even to the bottom of the subsoil furrow. The working effects of the first experimental tail-board, although thus applied to an implement not originally calculated for the resistance thus induced, were so perfect, in as far as they extended, that to see it in operation was at once sufficient to convince the most stern doubter that the idea of, and the object sought for, had been most happily conceived and acted upon. To complete the original intention, there only remained now to have the whole implement made of sufficient dimensions and strength to resist the draught of four horses, by which means a depth of penetration extending to eighteen or twenty inches might be attained. The instrument thus conceived, was speedily constructed under his lordship's directions; and to this new form of subsoil plough we shall shortly have to make particular reference.

It soon became apparent to his lordship that, to do this powerful implement full justice, it would be necessary to have its forerunner of a suitable construction; for in this respect the old plough employed at Yester, though one of the most efficient of its class, was here found to be rather at fault. But here also his lordship was ready to supply the want; and by the true philosophical mode of induction, aided by numerous and untiring experiments on the large scale, a plough has been constructed having its mould-board formed upon a new system of lines, and of dimensions that render the plough capable of taking a furrow twelve inches wide and fifteen inches deep in the most effective manner. With this new plough as the forerunner, which it is proposed to name the "Tweeddale Plough," and the new improved tail-board plough, which may for uniformity be named the Tweeddale "Subsoil Trench Plough," the process of subsoil ploughing is performed in a manner the most perfect and effective that has hitherto been achieved—keeping in view, of course, that the work performed under the system which advocates a large intermixture of the surface and subsoils.

It is well known that such a system is not universally approved especially in England; but it ought to be equally well known in very many cases the intermixture of the surface and subsoils is highly beneficial, and will probably prove, from further expe- [illegible] ..mply breaking and

stirring the subsoil—will be the exception. But in whatever light the subject of subsoiling may be viewed, the Marquis of Tweeddale has, by the introduction of this forerunner plough, rendered an important service to agriculture, inasmuch as the implement seems to be the most effective trench plough hitherto brought out, as well as the most effective forerunner for subsoil-ploughing.

In the accompanying Plate I. there are represented the two ploughs above alluded to, as also another smaller one for ordinary use, named the Yester Plough. Fig. 1 is the new trench plough, or forerunner, to the subsoil, and now named the Tweeddale plough. Fig. 2 is the subsoil trench plough; and fig. 4 the Yester plough.

Agreeably to the Marquis's opinion that wood is still the most suitable material for the construction of the framework of ploughs, the Tweeddale plough is so constructed. Its parts are of considerable strength, aad its whole dimensions greater than ploughs of the common sort; the length of the beam, from its insertion at *a* to the point *b*, is 6 feet 9 inches; the length of the main stilt, from *a* to *c*, is 5 feet 6 inches; and the extreme length in a straight line, *b* to *c*, is 11 feet 8 inches. With the exception of these dimensions, the mould-board is the chief point in which it differs from other ploughs.

But to assist in rendering this difference intelligible, we refer to fig. 7, which represents the mould-board by a series of transverse sections, or vertical planes, cutting the body of the plough at right angles to the land side. The letter *a* represents the beam of the ploughs so cut across, and the line *a g b* the land side of the plough, *b f c* being the plane of the sole; the line *d e* is the top edge of the mould-board; the first sectional line *f g* is the front edge of the mould-board, where it joins with the sock, which is here supposed to be cut across by the section *g b f*. The succeeding lines show that, in the breast or fore parts, the surface of the mould-board is very flat, resembling the west of Fifeshire ploughs. As these lines recede by 3 inches each, towards *d*, it will be seen that they become more and more curved, giving a barrelled shape to the extreme back parts, thus differing largely from any other mould-board with which we are acquainted. The extreme length of this mould-board, from *a* to *d*, fig. 1, is 38 inches; its height in the fore part, when in work, from the sole line *f* to *e*, fig. 7, is 16 inches, and at the back from *c* to *d* 18 inches; its extreme spread measuring from the land side at *g* to *h*; the tail of the mould-board is 20 inches. This plough, as already mentioned, works with great precision, cutting a slice 14 to 15 inches deep, and 12 inches wide, leaving a clean and flat soled furrow; but the furrow-slice taken by it, in place of being turned over in an entire form in the manner effected by our *fine* working ploughs, is only so far turned, and at the same time broken up, as serves to present the soil in the best possible state to the ameliorating effects of atmospheric influences. In this respect the plough seems to stand unequalled; and since the extinction of the old Scottish wooden ploughs, no implement has approached the point to which this has attained, for enlarging the extent of surface exposed to the atmosphere.

Fig. 2 represents the Tweeddale Subsoil Trench Plough, with 4 wheels, as in Read's Plough; but in other respects, except the new share and tail-board, is the same as now manufactured under Mr Slight's improvements; and the implement being so well known in all its forms, both in wood and iron, it is unnecessary to describe it in detail. The grand and important achievement effected upon it by the Marquis lies in the share or sock, and its appendages; these consist of the stem or coulter *a b*, the share or sock *b c*, attached to it, and the tail-board *b d*, also attached to the coulter. The coulter is a bar of the best scrap iron, about 2½ feet long, and 3½ inches broad, and 1¼ inch thick. At bottom, it is forged with a club-end, fitted to receive the attachment of the body of the share by welding or by riveting, and to the hind part of the latter the tail-board is strongly fixed by screw bolts.

Fig. 5 is a plan view of the share with its tail-board; *a* is the place of insertion of the coulter; the length of the body of the share from its junction *b c*, with the tail-board, to the front *d*, is 24 inches, while its extreme breadth towards *b c* is 12 inches;

but this latter dimension is increased by the addition of a steel cutter, *e f*, on each to about 14 inches. These cutters are fixed with screw-bolts having counter-sunk heads to the edges of the share below, and, as they are the members most subject to wear, they are thus easily removed for repair or renewal. In cross section the share has a decided convexity on the upper surface and concave below, which last is increased by the steel cutters being applied below. The tail-board *b c g h*, 18 inches in length and 9 inches broad, is fixed to the hind part of the share by means of a clamp and screw-bolts—the clamp being placed underneath, so as not to present any obstruction to the action of the share in passing through the subsoil. This is the most important member of the arrangement, and requires to be duly formed and placed. In its cross section it is about half an inch thick, formed with a slight concavity on its upper surface, for the purpose of more readily preventing too large a portion of the surface-soil to descend to the bottom of the furrow. The inclination of the tail-board may be varied according to the amount of intermixture that the agriculturist may approve of; but, in the present case, it is worked with an elevation of 9 inches at the hinder end, above the plane of the plough's sole.

A geometrical elevation of the coulter and share is seen in fig. 6; *e d* is the near edge of the share, *c g* that of the tail-board, the upper line in the former, and the lower line in the latter, indicating their convexity. In this figure also is exhibited the shield *i*, applied to the sides and front of the coulter or stem of the share. It is formed of cast-iron and tempered iron, embracing the stem, and terminates forward in the line *k i*, in a sharp cutting edge. Its object is partly to defend the coulter, but chiefly to cut with facility the slice of subsoil as it rises on the share into two ribbons, which, as the implement passes on, are elevated upon the tail-board. The shield is fixed to the coulter by means of the box *k*, which is passed down upon the stem till it press upon the shield, and is there secured by the screw-bolts seen in the figure in front and back of the stem.

A sectional elevation of both ploughs is seen in fig. 3, upon a smaller scale, as they appear in actual operation. The Tweeddale plough is here represented as taking its furrow of 15 inches in depth, and followed by the trenching subsoil plough going 6 inches deeper. The wheels of the latter are seen resting upon the sole of the furrow just taken out by the Tweeddale plough, while the tail-board appears doing its office of elevating the slice of subsoil—forming a continuous succession of the void space *a* under its extremity. This void is with equal continuity filled in, partly with portions of the upper soil, which fall down between the edges of the tail-board and the sides of the open furrow, the remainder being filled up by the return of part of the elevated subsoil, broken and pulverised by falling over the end of the tail-board, as the implement passes from under the subsoil, while other portions of the elevated matter remain intermixed with the upper soil.

The successful results arising from the new Tweeddale plough, fig. 1, has led to the construction of a common two-horse plough, having its mould-board formed on the same principles as that of fig. 1. This plough is represented in fig. 4, and is named the Yester Plough; and its framework, like the other, is constructed of wood, and, excepting the mould-board, there is no material difference from the common wooden plough. In the mould-board itself there is a perceptible difference in the greater length of the straight portion *e f* of the lower edge as compared with that of fig. 1. In the breast, also, of this mould-board there is a slight difference from the others, as will appear by comparing its series of sectional lines with fig. 7, already referred to. Fig. 8 contains the series of vertical sections of this mould-board, also at 3 inches asunder. In these it will be observed that the lines towards the front and upper parts are more convex than in the other, but much less curved as they descend to the lower edge; at the back parts, or tail of the mould-board, the lines approximate more nearly to those of the other mould-board, allowance being made, of course, for the difference in dimensions. The length of this mould-board, from *a* to *d*, is 32 inches; its height at the fore part, *f* to *e*, 14 inches; and the hind part, to *d*, 16 inches; its extreme spread, from *g* to *h*, is 18 inches. The work performed by this plough is of the most satisfactory description, answering all the ends of sound serviceable ploughing to the depth of ten inches.

It may be proper to notice that, in both implements, the sock is of the East Lothian or Small's original form, meeting the mould-board at a point corresponding to that which would cut 4 or 5 inches from the nose of the Wilkie and the Currie mould-boards.

We have had frequent opportunities of observing the progress

of the improvements here but slightly referred to; and these observations refer more particularly to one farm, that of Broadwoodside, which has for a period of six years been regularly managed under this system of *deep* ploughing. It is consistent, also, with our knowledge, that at the commencement of that six years' course of improvement, the lands of that farm were by very competent judges valued at not more than from 7s. to 10s. of yearly rent per Scotch acre; and that in its present state, like judges consider it worth not less than £2 an acre, while others value it at £3. The mainsprings of this improvement have lain chiefly in a perfect system of drainage, and of deep ploughing. The manuring process has not been at a more expensive rate than is commonly followed by every judicious farmer. The general results may be very fairly inferred from the produce of its turnip crop of the present season; and we are safe to say that that crop will bear comparison with the like produce of any farm in Scotland.

It may perhaps turn out that there is something in the subsoil of the Yester lands peculiarly favourable to the system of ploughing there adopted; and such a surmise has frequently been suggested. There are others, however, who believe that the subsoil here differs in no respect from that which occurs in many of the cultivated districts of the country. In order, therefore, to bring these opposing views to the test, it would certainly be of very great importance that a searching analysis were made of specimens of this, and apparently similar subsoils, by the Chemist of the Highland and Agricultural Society.

In regard to the terror expressed by many farmers, of bringing up the subsoil near the surface, as is and has been habitually done at Yester, we deem it wholly chimerical; for although injury may have been sustained, in some instances, of bringing up the subsoil at an improper period of the rotation—when a white crop, for instance, was to follow, or before the land had been thoroughly drained—no instance, that we are aware of, of such injury having been sustained, can be adduced after the thorough drainage of the land. In the case of trenching land with the spade, where the practice is entirely to invert the relative position of the soil and subsoil, it is quite possible that the newly turned-up crude subsoil may be unable to perform at once the proper functions of a soil to a grain crop; but the trenching and subsoiling, performed by the Tweeddale and trenching subsoil-ploughs, as shown in fig. 3, operate in a very different and much better manner than the spade. In this double process the subsoil is not brought entirely to the surface, but to within four or five inches of it, and in its elevation becomes mixed with a portion of the surface soil turned over by the preceding Tweeddale plough; and so intimate is the mixture of the soil and subsoil thus effected, that on digging into the ploughed ground with a spade, the upper and lower soils can scarcely be

distinguished from each other. The distinction can only be observed when the subsoil happens to be of an uncommon colour, such as bright red or yellow; when blue, green, black, or grey, the mixture is not discernible. In the soils thus mixed we have no doubt that a crop of oats would grow well, although it is much better farming to take a green crop immediately after land has been trenched or subsoiled.

One great advantage of this mode of trench-ploughing the stubble-land in autumn is, that the soil requires very little working in spring to fit it for the reception of the earliest species of green crop that may be sown at that season; and, even when practised late in spring, it renders the land fit for drilling up for turnips without further labour. The field that now bears the crop of turnips we have alluded to above, was so trench-ploughed in the spring of 1849, within three weeks of the season for sowing the turnips; and the crop, with only ordinary manuring, has proved an excellent one. When facilities such as these are put into the power of the farmer, to work his turnip land in an efficient manner, with a little more than labour, and with economy of time, the culture of that indispensable green crop may be sensibly extended over the fallow break of the farm.

One point of excellence in the work performed by these ploughs must not be omitted to be mentioned. On removing the ploughed surface-soil with the spade, the furrow-sole is found to be flat and even, whereas the sole left by ordinary subsoil-ploughs, such as Smith's, is ribbed. On the supposition that a field is subsoil-ploughed at right angles to the lines of the drains on inclined ground, such ribs tend to interrupt the flow of water upon the sole towards the drains, while a flat sole would rather facilitate its passage.

Another advantage may be mentioned. Ordinary subsoiling is recommended, because the air is admitted to the subsoil which is kept below, and only brought up, if ever, after it is supposed to have become ameliorated by the air; whereas by this subsoil trenching, the subsoil is at once mixed with the upper soil, and is rendered useful as so much fresh soil.

We think it right to state, in conclusion, that although the Marquis has been urged to place his system of deep cultivation before the public, he properly declined doing so, until all the implements were brought to an efficient state, and sufficient experience had been acquired of their efficacy, which his lordship considers he has now attained, and on that account has recently called the attention of agriculturists to his successful experiments. We are satisfied that the promulgation of this substantial mode of working land will induce many farmers to adopt it the more unhesitatingly that they may witness its strikingly good effects upon the farms of Tester Mains and Broadwoodside.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat.		Barley		Oats.		Rye.		Pease.		Beans.	
1849.	s.	d	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Sept. 1.	47	6	30	10	19	8	27	5	28	9	28	2
8.	47	9	30	8	20	6	27	8	30	10	29	9
15.	45	11	30	1	20	7	28	2	32		28	7
22.	44	2	30	11	19	1	26		33	2	28	8
29.	44	3	31		20	5	25	6	33	6	28	5
Oct. 6.	44	9	30	2	20	3	24	10	31	11	27	1
13.	43	6	30	1	20	6	27	2	34	4	27	2
20.	44	9	30	7	20	7	25	5	32	6	26	4
27.	44	6	31	2	18	11	27		35	8	26	11
Nov. 3.	45	3	30	5	18	8	23	2	30	9	29	11
10.	43	1	31	2	18	4	27	6	33	2	26	11
17	43	2	30	3	18	5	23	4	32	7	29	5
24.	45	1	29	7	18	6	23	1	33	5	29	7

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1849.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Sept. 5.	50	1	26	1	21	8	32		32	6
12.	47	9	25		22	1	31		31	4
19.	40	6	24	9	20	4	30	10	31	2
26.	41		24	2	18	7	31		31	6
Oct. 3.	41	1	23	9	18	6	30		30	6
10.	41	7	23	10	18	11	29	6	30	1
17.	42	7	23	7	19	5	29	8	30	2
24.	42	8	22	6	19	7	32		32	10
31.	40	3	22	8	18	11	31	8	32	2
Nov 7.	38	7	23	6	18	4	31	9	32	8
14.	38	2	22	2	17	4	29	6	30	
21.	37	4	22	3	17	3	29	4	29	10
28.	36	3	21	10	17	4	27	6	28	2

LIVERPOOL.

Date.	Wheat.		Barley		Oats.		Rye.		Pease.		Beans.	
1849.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Sept. 1	48	4	25	6	17	10	26	4	28	7	32	8
8.	47		26	9	18	5	25	9	28	10	31	10
15.	39	11	28	10	18	9	25	4	29	2	31	6
22.	39	2	29	6	17	8	24	8	27	9	32	
29.	40	6	28	2	17	7	24	5	27	6	31	
Oct. 6.	40	11	27	10	18	1	23	8	26	9	33	3
13.	41		29		17	2	23	2	28	2	31	5
20.	39	8	29	3	15	9	22	9	29	4	29	10
27.	39	5	27	8	15	10	22	6	28	8	32	1
Nov. 3.	41	9	28	5	17	2	22	2	28	6	33	2
10.	38		27	9	15	7	22	8	28	2	29	4
17.	36	11	28	10	16	5	23	4	29	4	30	1
24.	38	5	28	1	17	8	24	2	29	2	30	2

DUBLIN.

Date.	Wheat, p. barl. 20 st.		Barley, p. barl. 16 st.		Bere, p. barl. 17 st.		Oats, p. barl. 14 st.		Flour, p. barl. 9 st.	
1849.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Sept. 7.	21	4	12	11	9	2	9	8	15	8
14	20	11	12	10	9		9	3	15	6
21.	19	6	13		8	10	9	4	15	3
28.	20	9	13	2	8	9	9	6	15	
Oct. 5.	20	2	12	1	8	6	9		15	6
12.	19	11	11	9	8	6	8	10	14	1
19.	19	10	12		9	2	9	2	14	4
26.	21	3	11	2	9	1	9		14	3
Nov. 2.	19	11	9	2	8	11	9	2	14	1
9.	19	6	10	5	8	9	8	10	14	4
16.	19	10	11	3	9	1	9	2	14	8
23.	20	9	13	2	9	8	9	4	15	
30.	20	8	12	10	9	6	9	6	15	2

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average.	Wheat. Aggregate Average.	Barley. Weekly Average.	Barley. Aggregate Average.	Oats. Weekly Average.	Oats. Aggregate Average.	Rye. Weekly Average.	Rye. Aggregate Average.	Pease. Weekly Average.	Pease. Aggregate Average.	Beans. Weekly Average.	Beans. Aggregate Average.
1849.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 1.	44 8	46 8	28 3	26 1	19 3	19 3	27	26 6	28 0	30 3	32 3	32 1
8.	44 6	45 11	28 0	26 3	18 4	19	25 11	26 5	29 7	29 10	31 2	31 10
15.	43	45 2	27 1	26 4	18 6	18 10	26 7	26 8	30 1	29 6	30 8	31 8
22.	41 9	44 2	27 2	26 7	17 10	18 8	28 11	26 6	30	29 5	29 9	31 4
29.	42 4	43 6	27 4	26 10	17 11	18 5	25 2	26 2	31 8	29 9	29 5	30 11
Oct. 6.	42 6	43 1	27 7	27	17 5	18 3	24 9	25 11	29 5	29 11	29 9	30 5
13.	41 4	42 7	28	27 4	17 2	17 10	24 5	25 6	31 8	30 5	28 10	29 10
20.	41 1	42	28 2	27 6	17 4	17 9	24 9	25 3	30 3	30 6	29 5	29 6
27.	41 7	41 9	28 5	27 9	17 2	17 6	23 8	24 9	31 7	30 9	28 11	29 5
Nov. 3.	41 6	41 8	28 7	28	16 10	17 4	23 9	24 3	29 7	30 3	29 10	29 2
10.	40 7	41 5	28 8	28 3	16 11	17 2	22 6	23 10	30 11	30 7	29 4	29 3
17.	40 6	41 1	28 3	28 4	16 10	17 3	23 7	23 7	30 7	30 2	29 7	30 4
24.	40 4	40 11	29 4	28 5	17	17	24	23 6	30 8	30 7	29 8	29 5

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1849.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Sept. ..	Danzig	36 6 - 44 0	15 0 - 21 6	10 0 - 14 6	16 0 - 19 6	19 0 - 23 6	21 0 - 26 6
Oct. .	Danzig	35 6 - 42 6	15 6 - 22 0	10 6 - 15 6	15 6 - 18 6	18 0 - 22 6	20 0 - 26 6
Nov. ..	Danzig	36 0 42 6	14 6 - 20 6	10 0 14 0	16 0 - 20 0	17 6 - 20 6	22 0 - 26 6
Sept. .	Hamburg	35 6 - 40 0	16 6 - 22 6	10 6 14 6	15 6 - 19 6	17 0 - 20 0	20 0 - 24 [illegible]
Oct. ..	Hamburg	35 0 41 0	17 0 22 0	11 0 16 0	15 6 - 20 0	19 6 - 25 0	22 0 - 26 [illegible]
Nov. .	Hamburg	35 0 - 40 0	17 6 - 22 6	11 6 - 15 6	16 6 - 21 6	22 0 - 26 0	20 6 - 25 [illegible]
Sept. ..	Bremen	36 6 - 42 0	16 0 - 20 6	10 6 13 0	15 0 - 19 6	21 0 - 25 6	20 0 - 24 6
Oct. ..	Bremen	38 0 - 43 0	17 0 - 21 3	10 0 - 16 6	15 6 - 20 0	22 0 - 29 3	20 0 - 27 6
Nov. .	Bremen	36 0 - 41 6	15 0 - 18 6	10 0 - 14 0	15 0 - 19 0	23 0 - 28 6	21 6 - 28 6
Sept. ..	Königsberg	35 6 - 40 6	13 6 - 16 0	9 6 12 6	15 0 - 19 6	18 0 - 22 6	19 0 - 23 6
Oct.	Königsberg	32 6 - 40 0	14 6 - 17 6	10 6 - 14 6	15 6 - 20 6	16 6 - 21 6	21 0 - 24 6
Nov. ..	Königsberg	30 0 - 38 6	13 0 - 15 0	9 0 - 11 6	14 6 - 16 6	16 0 - 20 0	18 6 - 23 6

Freights from the Baltic from 3s. to 4s. 9d., and from the Mediterranean, from 7s. to 8s. 6d.

THE REVENUE.—From 10th October 1848 to 10th October 1849.

	Quarters ending Oct. 10. 1848.	Quarters ending Oct. 10. 1849.	Increase.	Decrease.	Years ending Oct. 10. 1848.	Years ending Oct. 10. 1849.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs	5,406,483	5,253,272		153,211	18,358,827	18,567,563	208,736	..
Excise . .	4,102,574	4,287,577	185,003	.	12,825,861	12,381,916	..	443,945
Stamps	1,461,492	1,686,747	225,255		6,203,105	6,328,213	125,108	..
Taxes .	215,656	203,057		12,599	4,308,474	4,326,951	18,427	..
Post-Office ..	221,000	224,000	3,000		786,000	852,000	66,000	..
Miscellaneous	33,923	41,902	7,979		182,203	342,543	160,340	..
Property Tax	1,802,890	1,914,006	11,116	..	5,385,498	5,383,199	..	2,299
	13,333,918	13,610,561	432,353	165,810	48,049 968	48,182,385	668,611	446,244
	Deduct Decrease .		165,810		Deduct Decrease .		446,244	
	Increase on the qr. .		266,543		Increase on the year		222,367	

TABLES OF BUTCHER MEAT.—Per Stone of 14 Pounds.

Date.	London Beef.	London Mutton.	Liverpool Beef.	Liverpool Mutton.	Newcastle Beef.	Newcastle Mutton	Edinburgh Beef.	Edinburgh Mutton.	Glasgow Beef.	Glasgow Mutton.
1849.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Sept. .	6 8 - 7 0	6 0 - 7 3	4 3 - 6 3	4 6 - 6 6	4 6 - 6 6	5 0 - 6 9	5 0 - 6 0	5 3 - 6 6	5 6 - 6 6	5 6 - 6 9
Oct. .	6 0 - 6 9	6 3 - 7 6	4 6 - 6 6	4 9 - 6 9	4 9 - 6 9	5 6 - 7 3	5 3 - 6 3	5 6 - 6 6	5 6 - 6 9	5 3 - 6 6
Nov. ..	6 6 - 7 3	6 3 - 7 3	4 6 - 6 6	4 6 - 6 9	4 6 - 6 9	5 3 - 7 0	5 0 - 6 6	5 3 - 6 3	5 3 - 6 6	5 6 - 6 6

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

English.	s. d. s. d.	Scotch.	s. d. s. d.
Merino,	11 0 to 16 6	Leicester Hogg,	9 0 to 13 6
.. in grease,	8 6 to 12 0	Ewe and Hogg,	8 0 to 10 6
South-Down,	12 0 to 16 0	Cheviot, white,	7 0 to 10 0
Half-Bred,	9 6 to 12 0	.. Laid, washed,	6 0 to 8 0
Leicester Hogg,	10 0 to 14 0	.. unwashed,	4 6 to 7 0
Ewe and Hogg,	8 0 to 11 0	Moor, white,	5 0 to 7 0
Locks,	5 6 to 7 0	.. Laid, washed,	4 3 to 5 6
Moor,	4 6 to 6 0	.. unwashed,	3 6 to 5 0

SCOTTISH TRANSATLANTIC INTERESTS.

HALIFAX AND QUEBEC RAILWAY AND COLONISATION PROJECT.

"An undertaking well worthy of the countenance of this government, and of the people of this and the neighbouring British provinces."—*Extract from the reply of Lord Metcalfe, Governor-General of Canada, to the Memorial of the Promoters, October* 1845.

"A project second in its importance to none which has ever engaged the notice of any colonial legislature in any portion of the British dominions."—*Speech of his Excellency Sir John Harvey, Lieut.-Governor of Nova Scotia, on opening the Legislative Assembly in* 1847.

In the article entitled "Scottish Agricultural Resources, and their neglect, in the Western Hemisphere," which appeared in the Number of this Journal for July last, we mentioned that a *petition* was presented to the House of Commons, at the commencement of last session, setting forth the steps taken in the matter of the Halifax and Quebec Railway and Colonisation project, and praying that all the documents and reports in the case, together with the "Memorandum and Protest" placed in Earl Grey's hands, as colonial minister, by a deputation from the Committee of the Baronets of Scotland and Nova Scotia, might be referred for the consideration of a select committee.

Very shortly afterwards, by command of her Majesty, the first report of the officers employed on the survey of the line of the projected railway between Halifax and Quebec was presented to both houses of parliament; and as several hundred miles of the railway will pass over unsettled territory, every foot of which belongs to the baronets and other tenants-in-chief of the Scottish crown, we proceed to develop the plan, so far as it may be gathered from a variety of printed documents now before us. This we begin to do on the eve of the assembling of parliament, in the hope that some one or other of the Scottish representatives will take up the matter during the course of the session, and make it the subject of a specific motion.

This great trunk-line of international communication between Great Britain and the Canadas was brought under the attention of the home government, and of the Governor-general of Canada and the Lieutenant-governors of Nova Scotia and New Brunswick, by memorials from the promoters in July 1845. These memorials, which are counterparts of each other, commence by showing that a public company was, at their date, in course of being set on foot in London, for the purpose of constructing a line of railway which should connect the provinces of Nova Scotia, New Brunswick, and Canada, by a direct line of steam communication, commencing at Halifax, and proceeding to Quebec and Montreal, with power progressively to extend the same westward to the Pacific Ocean, form branches, and purchase and improve lands upon the line. They embody a paragraph, first copied from American prints into British newspapers in March 1845, headed "Gigantic Project," which shows that Mr Whitney, an enterprising New York merchant, had

proposed the construction of a railway from the western shore of Lake Erie to the navigable part of the Columbia river, in the Oregon territory, to become the future medium of the Americo-European trade with China. They cite the opinions of the late Mr M'Taggart, and the statements embodied in the paragraph above referred to, in support of the belief that a line of steam-packet and railway communication may be effected between Great Britain and China, across British North America. And finally, in consideration of the vast commercial and political importance of the line—that it would supersede the necessity for the contemplated military road along the boundary line in New Brunswick—afford an immense opening for the safe and profitable investment of British capital—and, above all things, furnish progressively boundless facilities for the systematic plantation and settlement of the whole frontier territory of British North America, from the Atlantic to the Pacific—the promoters ventured to hope that they would procure for the undertaking the especial patronage and support of the home administration, and the three provincial governments.

Three of these memorials crossed the Atlantic in July 1845; and the fourth having been referred by the prime minister to the secretary of the colonies, Lord Stanley, on the 25th of that month, received a deputation from the promoters, comprising the Hon. Sir Richard Broun, Bart.; Edward Hoare, Esq.; F. W. Hamilton, Esq.; and others: accompanied by Mr William Bridges, secretary, and John Valentine, Esq., civil engineer. On this occasion, after a conference on the subject, the colonial minister assured the deputation that if the project should be favourably regarded in the colonies immediately interested, it should not fail to receive the sanction and support of the government at home. Shortly after this interview, communications were received first from Viscount Falkland, Lieutenant-governor of Nova Scotia, stating that "he conceived the contemplated railway would, if carried into effect, be productive of so much benefit to the province of Nova Scotia, that he would most willingly do everything in his power to forward the views of the projectors." Second, from his Excellency Sir William Colebrooke, acquainting the promoters, "in reply to their application for support from the provincial government of New Brunswick, that he had the satisfaction of being able to inform them that there was a very general disposition to facilitate and promote the undertaking in that province; that he hoped, by the next packet, to forward to them the information of the proceedings of local associations taking an interest in the subject; and that, in compliance with their request, he had communicated with Her Majesty's Government on the subject by the present mail." And third, from Lord Metcalfe, Governor-general of Canada, to the effect that "his Excellency in council had given to the memorial of the promoters that degree of consideration which the vast

importance of the subject merits; that a chain of steam-communication from England to Montreal was calculated, in a high degree, to promote the interests and advance the prosperity of Canada, and was an undertaking well worthy of the countenance of the Canadian government, and of the people of that and the neighbouring British provinces; that the Governor-general in council, without being in possession of more information regarding the proceedings of the company projected by the memorialists, was unable to do more than to assure them that they might rely upon the government of Canada for whatever protection and aid it might be consistent to render; and that, where the railway might pass through the unconceded lands of the Crown, it would confer the right to the company of using what was necessary for the purposes of the railway."

Immediately consequent to the date of these respective answers from the colonial executives to the memorials of the projectors, numerous public meetings took place in each of the provinces of Nova Scotia, New Brunswick, and Canada, of the principal inhabitants, on the subject of the railway; when resolutions approving of the undertaking were passed, and numerous local committees of correspondence and co-operation were appointed. To these provincial movements we shall only so far advert as to cite the resolutions passed at two meetings—one composed of many of the most influential persons in Canada, held at Quebec in October 1845, the mayor of the city presiding; the other a meeting of the inhabitants of the counties of Westmoreland in New Brunswick, and Cumberland in Nova Scotia, held at Sackville on the 1st of November that same year, the Hon. William Crane in the chair. On the former occasion, the resolutions unanimously passed were to this purport—namely, "That the citizens of Quebec had learned with great satisfaction the proceedings which had been adopted in England, and in the sister provinces, for promoting the formation of a railway between Halifax and Quebec, with a view to its being extended, so that the inhabitants of British America might have a sure and speedy intercourse with the United Kingdom, at all seasons of the year, through a port within their own limits; that the proposed railway, besides facilitating commercial intercourse, would have an important effect in adding to the security of the provinces as a part of the British empire; that, therefore, it was desirable that the line should be surveyed by scientific men of established character as speedily as possible, with the concurrence of the imperial government; and that an humble address should be presented to his Excellency the Governor-general, signed by the Mayor of Quebec in name of the meeting, with a copy of the resolutions passed that day, praying that his excellency would be pleased to bring the subject thereof under the favourable consideration of Her Majesty's Government, and that he would take such

other steps, as in his opinion might be deemed most expedient, for furthering the undertaking." So far for Canada. On the latter occasion, the joint county meeting of leading individuals, representing the public feeling of Nova Scotia and New Brunswick, the following resolutions were carried, with one voice—1*st*, "That this meeting views the establishment of a line of railway connecting the provinces of Nova Scotia, New Brunswick, and Canada, as contemplated by a public company now in course of formation in London, as an object closely connected with the best interests of these colonies; being at the same time eminently calculated to strengthen the ties which bind us to the mother-country, and to afford the means of establishing that perfect intercourse (indisputably so imperfect now) which is so essential to their mutual prosperity and happiness. 2*d*, That this meeting regards with marked approbation the proceedings of the promoters of this great national undertaking, and will cordially co-operate with them, and with the legislatures of these colonies, in carrying this magnificent enterprise into operation, by giving its assent to free grants to the company of such portions of the unconceded lands over which the contemplated line may pass, and also to such an annual appropriation from the provincial revenues, proportional to the advantage that will be derived from this great work, and to the state of the funds of the province, and by affording every other facility and encouragement within its power."

These foregoing particulars are taken from a pamphlet, illustrated by a map, published in the close of 1845, entitled "Halifax and Quebec Railway, with copies of Memorial, Correspondence, Reports, Notices, &c."* Since that period, resolutions approving of the railway were passed by each of the legislative assemblies of Canada, Nova Scotia, and New Brunswick; and in consequence of recommendations from them to that effect, her Majesty's ministers determined, in June 1846, on undertaking a survey of the proposed lines of trunk railway communication in British North America, with the view of ascertaining which is the best line to be adopted with reference to imperial and military as well as provincial and commercial interests. This determination of the government was communicated to the promoters by a letter from Mr Gladstone, then colonial secretary, dated the 11th of that month; and, at the same time, in answer to certain propositions bearing upon the internal arrangements of the public company for constructing the railway between Halifax and Quebec, which the promoters were engaged in taking steps to organise, "he hoped the promoters would pursue those arrangements in any way which they might consider requisite for their own interests—he not being particular aware of any reason for the postponement by the

* Published by Effingham Wilson, Royal Exchange, London, with two Appendices.

company of any proceedings that they might have in view with reference to filling up the vacancies in the direction." Some months previous to this communication, Mr Gladstone had expressed, to a deputation from the promoters, the strong interest which he took, in common with her Majesty's ministers, in this project. And on the present administration coming into office, a communication was made to Earl Grey, to which the following reply was received from Mr Hawes, dated the 22d of October 1846,—"I am directed by Earl Grey to acknowledge the receipt of your letter of the 10th inst., in which you lay before his lordship the proceedings and views of the gentlemen who are associated with you in the object of establishing a railway in the North American continent between Halifax and Quebec. Lord Grey directs me to inform you in answer, that he is fully sensible of the great importance of the subject which you have brought under his consideration, and that her Majesty's government will be anxious to give all the support in their power to the projected railway; but that until the survey which is now in progress shall have been made, and some estimate formed of the probable cost of the undertaking, and also until the views of the different provincial legislatures as to the best mode of carrying it into effect shall have been ascertained, it will be premature to enter into any consideration of the several proposals contained in your letter."*

Since the date of this letter the final report of the surveying officers has been published; and before citing some extracts from its pages, we shall only further observe, that the petition, which is annexed to this article, was presented to the House of Commons. Upon that document it will suffice to remark, that had the views of its author, Sir Richard Broun, upon railway legislation in 1833, been taken up by the late Earl Grey, then prime minister, the gross railway traffic receipts for the year ending the 31st of December last, amounting to the enormous sum of £11,013,820 sterling, would have found its way into the public coffers. The consolidation of internal intercourse, and the making the conveyance of persons, letters, and goods, a source of revenue to the state, was urged upon Earl Grey then—for these amongst other reasons, namely—"That the system which has hitherto prevailed of government allowing individuals to reap the enormous wealth which new inventions have produced, has been highly detrimental to public wealth, industry, and contentment. That the appropriation by government of new inventions is not a monopoly for the government, but a monopoly for the people; whereas these being left to private enterprise, is making them the monopoly of stock-jobbers, fundholders, and capitalists—a monopoly hitherto fostered by gov-

* Letter from Mr Hawes, M.P., to the Secretary of the Promoters, 22d October 1846.

ernment, to the injury and impoverishment of nine-tenths of the community, and which has created a degree of jealousy and animosity between the poor and the rich, that has now (1833) attained a height threatening alike the peace and order of society. That the adoption of the project submitted would provide effectually for the public safety, which infallibly would be endangered if the introduction of steam transit should be left to the competition of rival companies. That it would greatly and judiciously extend the patronage of the Crown, without compromising the rights of the subject. That it would, at '*a moment* (to cite Earl Grey's own language in parliament) *when a restless spirit of discontent is abroad*,' arm, in the government pay, with the pick-axe and spade, instead of with the bayonet and sword, thousands, in every district of the kingdom, of those who are now idle and disaffected. That it would progressively admit of the extinction, not conversion, of taxation. And finally, that it would diffuse public wealth, with public benefit and public satisfaction."* This proposition was set aside and disregarded by the then government—for what? Let the *Times*, so recently as the 26th of December last, answer:—"To diffuse, for years past, agony of mind and wide-spread ruin over the whole framework of English society, in consequence of the unhesitating trickery, the scandalous jobbing, and the straightforward swindling, of which men who have thrust or wormed themselves into the irresponsible administration of £300,000,000 of stock, have been beyond all doubt, beyond all question, proved to be guilty." But what matters that? If the reader will take the trouble to compare notes, he will discover, that about the self-same period that Sir R. Broun suggested a plan which, if adopted, would not only have saved the nation from *railway mania* and *railway panic* catastrophes, but have likewise brought in annually a larger clear revenue to the treasury than what the income-tax produces. Sir Richard Broun failed, therefore, in his design to effect that which, apart from all other public considerations, would have relieved the landed interest of road-trust debts amounting to £10,000,000 sterling, contracted under the legislative sanction of 3783 road acts. But to return from this digression to the final report of the officers employed to survey the line of the projected railway between Halifax and Quebec. From it, the most authentic document that has ever appeared in print on the soil, capabilities, and resources of British North America, south of the river St Lawrence, we find that the Governor-general of Canada (the Earl of Elgin) thus speaks of the undertaking, in a despatch to Earl Grey bearing date the [illegible] December 1848:—"On the vast importance of the undertaking, whether as affecting imperial or provincial

* Vide Journal of Elemental Locomotion, for March 1833.

interests, I feel that it is altogether unnecessary to insist. The subject has long been before the public, and its manifold recommendations have been ably stated in various publications, official and unofficial, as well as in the valuable reports of the surveying engineers. I cannot, however, refrain from observing, that while on the one hand no undertaking seems to me so well calculated as this to connect the provinces together, to promote the interests which they have in common, to inspire them with a consciousness of their own strength, and thus to fit British North America for the fulfilment of its high destinies; so, on the other, none appears to be more likely to increase the population, extend the trade, and develop the local resources of each: and if this remark be true as applied to Canada, still more emphatically does it hold good of the lower provinces." The length of the railway from Halifax to Quebec—*viâ* Truro, Amherst, Bay Verté, Shediac, Miramichi River, Bathurst, Dalhousie, the Metapedia River, &c.—will be 635 miles; and it will pass through 1,080,000 acres of ungranted land in Nova Scotia; 4,747,000 acres do. in New Brunswick; and 8,600,000 do. in Canada: total, 14,427,000 acres. The extent of this vacant acreage will be the better understood when we mention, that in Scotland there is, of cultivated land, only 5,265,000 acres; the uncultivated and unprofitable making up, in addition, a total of 19,738,930. Again, in New Brunswick alone, which is only one district of New Scotland as originally bounded, there are 600,000 acres cultivated, 16,400,000 uncultivated, and 3,000,000 unprofitable—total, 20,000,000. Hence New Brunswick, which is an outlying portion of Mid-Lothian, at eight days' distance from the mouth of the Clyde, is larger than the whole mother state by two hundred and sixty-two thousand acres. Further, whilst the population of Scotland amounts to 2,628,957 souls—of whom, according to Dr Alison, *one-tenth* are paupers—the inhabitants of New Brunswick do not exceed 208,000, being at the rate of one individual for each ninety-six acres. Compare this state of things with Ireland, in which country there are seventeen millions of acres of ground fit for cultivation, with a population to support of 8,000,000 souls.

It is altogether impossible to condense into one or two paragraphs of an article such as this, a voluminous report, extending, with appendices, to seventy-three folio pages. *Inter alia*, however, the surveying officers observe—"If the land upon the line yet uncleared and fit for cultivation be added, which remains in the northern section of Nova Scotia, and again between the boundary of New Brunswick and the river St Lawrence to the east of Quebec, then there would be a quantity nearly equal to that of England itself, supporting a population of 400,000 souls." Further—"It is not too much to say, that between the Bay of Fundy and the St Lawrence, in the country to be traversed by the

proposed railway, there is abundant room for *all* the surplus population of the mother country." Again—"Of the soil, climate, and capabilities of New Brunswick, it is impossible to speak too highly. There is not a country in the world so beautifully wooded and watered. An inspection of the map will show that there is scarcely a section of it without its streams, from the running brook up to the navigable river. Two-thirds of its boundary are washed by the sea; the remainder is embraced by the large rivers St John and Restigouche. For beauty and richness of scenery this latter river and its branches are not surpassed by anything in Great Britain. Its lakes are numerous and most beautiful, its surface is undulating hill and dale, varying up to mountain and valley. It is everywhere, except a few peaks of the highest mountains, covered with a dense forest of the finest growth. The country can everywhere be penetrated by its streams. Its agricultural capabilities, its climate, &c., are described in Bouchette's works, in Martin's *British Colonies*, and other authors. The country is by them, and most deservedly so, highly praised. For any great plan of emigration and colonisation there is not another British colony which presents such a favourable field for trial as New Brunswick. To 17,000,000 of productive acres there are only 208,000 inhabitants. Of these, 11,000,000 acres are still public property. The rivers, lakes, and sea-coasts abound with fish. Along the Bay of Chaleurs it is so abundant that the land smells of it: it is used as manure; and, while the olfactory senses of the traveller are offended by it on the land, he sees out at sea immense shoals darkening the surface of the water. The present limited population being so generally engaged in the pursuit of the timber trade and the fisheries, there is the richest opening for agriculturists."

Our readers will bear in recollection that New Brunswick, to which district these remarks by the surveying officers specially refer, is only one portion of the magnificent extent of territory—some of it continent, some of it island—embraced by the ancient and royal *Province of New Scotland.* Regarding what is now called Nova Scotia, the appearance of our first article, in the number for July last has led to the publication of an interesting and valuable series of six letters in one of the Glasgow papers,* and now published in another form,† on the climate, the soil and agriculture, the fisheries and minerals, &c., of Nova Scotia. The author of these letters states that, having resided in Canada, New Brunswick, and Nova Scotia, at various seasons, in the course of several years, and feeling a lively interest in the prospect of a well-regulated system of emigration—which would most unquestionably conduce greatly to the advantage of both Scotland and

* See the *Glasgow Herald*, 3d September, and following numbers, to the 7th December 1849.

† *Nova Scotia.* By Joseph Outram, Esq., price 8d. Blackwood: Edinburgh.

the colonies—he is of opinion that, "In point of soil and climate, Canada is not to be considered as before New Brunswick and Nova Scotia—which last are much better adapted to the constitutions of Scotchmen. Then the advantages which they possess in point of situation are eminent. In Canada, the navigation is closed during one-half of the year; in these, commonly called the lower provinces, it is open all the year round. Canada is at a greater distance from Great Britain than a considerable portion of the United States is, while New Brunswick and Nova Scotia are nearer than any other point of the American continent; consequently the voyage is shorter, and the expense of freight and passage to and from this country less. In mineral wealth they are unquestionably more abundant than Canada. But, as a country for agricultural emigrants, I venture to say that Nova Scotia is preferable to New Brunswick. For the accuracy of this opinion, I would appeal to the judgment of any person who has had an opportunity of visiting and inspecting these two provinces." The writer of this, not having crossed the Atlantic, is unable to say, from personal observation, whether the eastern or western half of *New Scotland* is the best. But, throughout its entire length and breadth, the vegetables, crops, and fruits of England grow in abundance and perfection. We have now before us the following testimony by an intelligent English traveller, who twice traversed the country between the Bay of Fundy and the Bay of Chaleurs, in the summer and autumn of 1846—"From its position, soil, and climate, I consider New Brunswick possesses many advantages for emigrants over Canada, South Australia, and New Zealand; and, by documents, &c., I am prepared to prove it. In the counties of Cumberland, Northumberland, Gloucester, and Restigouche, particularly in the two latter, the soil cannot be surpassed, and is not equalled by any that I have seen in England or on the Continent. As a proof, wheat weighs 68½ lb. to the bushel; and at the agricultural show at Bathurst the average was 66 lb., and other produce in proportion. The climate is most salubrious and healthy." * Finally, upon such points as industrial resources, natural capabilities, &c., we cite the following extract from the report of the surveying officers:—"No portion of the American continent possesses greater productive means for the maintenance of large and flourishing communities. An almost boundless range of the richest soil still remains unsettled, and may be rendered available for the purposes of agriculture. The wealth of inexhaustible forests of the best timber in America, and of extensive regions of the most valuable minerals, have as yet been scarcely touched. Along the whole line of sea-coast, around each island, and in every river, are to be found the greatest and richest fisheries

* Letter from J. C. Ord, Esq., late High-Sheriff of Yorkshire.

in the world.* The best fuel, and the most abundant water-power, are available for the coarser manufactures, for which an easy and certain market will be found. Trade with other continents is favoured by the possession of a large number of safe and spacious harbours; long, deep, and numerous rivers, and vast inland seas, supply the means of easy intercourse, and the structure of the country generally affords the utmost facility for every species of communication by land. Unbounded materials of agricultural, commercial, and manufacturing industry are there."

Having brought, then, upon this and two former occasions, a vast variety of evidence together to instruct the conclusion that our home colonies, on the banks of the rivers St John and St Lawrence, are the best and nearest outlet for the redundant population of Scotland; and having traced the progress of the Halifax and Quebec railway and colonisation project, from its rise in 1845 to the present time, we now proceed to ask, In what way do these topics bear upon the general interests of the Scottish people? We reply, that this projected railway between Halifax and Quebec will pass over several hundred miles of vacant territory, every foot of which forms portion of the ancient crown domains of Scotland. It will pass also through the centre of two and a half million acres of ground, midway between Bay Verté and Restigouche Bay, which our baronets claim in compensation for the 150 baronies, and regalities of 16,000 acres each, which either actually were, or (but for the intervention of the civil wars,) would have (according to their patents) been assigned with their titles. On these twofold grounds, and the necessities that abound for a wide-spread and regulated system of emigration, we hold, that sufficient public reasons exist why, in accordance with the prayer of the petition annexed, some one or other of our fifty-three representatives in the House of Commons should make a motion during the present session for the select committee wanted. Take the map of New Brunswick—the one showing the explored route of the proposed trunk railway, as laid down by the royal engineers, Captains Robinson and Henderson—and consider what would be the benefits to the United Kingdom, to British North America, and the world at large, which would flow from the territory it will overpass being made a reflex of Scotland—a Protestant, monarchical, loyal state. Under a restitution of baronetage rights, a central city—which in honour of the founder of the order might be named JAMESTOWN ROYAL—would speedily arise near the junction of the Dungarvon and Renous rivers. This city, which in half a century would [illegible] become the seat of the hereditary

*According to Mr Montgomery Martin, Newfoundland has contributed, in fish [illegible], the value to the empire of about L.200,000,000, a richer wealth than the South American mines yielded to Spain. Yet the Newfoundland fisheries are not richer than are those of New Scotland.

viceroy, and the consolidated government of all British North America south of the St Lawrence, of a territory comprehending in all an area of 36,888,840 acres, (twice the extent of European Scotland,) of which a total of 24,088,623 acres are still vacant. It would be surrounded by a hundred and fifty Scottish clans—one hundred and fifty British sheet anchors in the day of revolt—amongst whom would be found a high-spirited landocracy, an enterprising tenantry, and a contented peasantry. Further, for the first time in the history of British colonisation, the germs of a monarchical nation would be planted, *rather replanted*, in the western hemisphere in those humanities—religious, educational, civil, political—which dignify and exalt the parent state. As an American statesman, predicting the importance that would one day be attached to the junction of the Atlantic and Pacific by means of the Nicaragua project, thus observed:—"On broad grounds, this work has been characterised as the mightiest event in favour of the peaceful intercourse of nations which the physical circumstances of the globe present to the enterprise of man. The whole world is interested in this work. I would not speak of it with sectional, even national feeling; but if Europe is indifferent, it would be glory surpassing the conquest of kingdoms to make this greatest enterprise ever attempted by human force entirely our own." Can this language be applied to an undertaking of mere *commercial* magnitude? What, then, would be the glory consequent upon the realisation of a design which, in addition to transit facilities, of a kind which would bring Great Britain and China within a thirty-days' intercourse with each other, and would also plant at every station of the route a *reflex* of Britain? It is now three years since his Excellency the Lieutenant-governor of Nova-Scotia, on opening the legislative session of that province, thus spoke:—"The period at, and the circumstances under, which we meet, afford me the opportunity of recommending to your continued attention an undertaking, second in its importance to none which has ever engaged the notice of any colonial legislature in any portion of the British dominions. I allude to the proposed railway between Halifax and Quebec, which will constitute the most important link in that great chain of communication, which may be destined at no remote period to connect the Atlantic with the Pacific Ocean, and to conduct to a British seaport, from those into which it is now forced, that vast stream of trade, not of our western possessions alone, but of the rich and extensive wheat and grain-growing districts of all central America." At the commencement of this article we spoke of Mr Whitney of New York's similar gigantic plan. That idea was developed in this country some three months posterior to the time when steps were first adopted by Sir R. Broun, in the city of London, to set a company on foot for the subject upon which we write. Mr Whitney's proposition to the American government was, that

it should give him a strip of land, sixty miles in width, across the country through which the road is to pass, from Missouri to the Pacific, and he would complete the road, depots, &c. With this offer the American government has long since closed; and, to use the words of a United States print, "the child is now born who will live to see one continuous line of railway from the Atlantic to the Pacific." Meanwhile the British government have allowed about four years and a half to elapse since the receipt of the memorial of the promoters which is above cited, without doing one single thing beyond that which half a dozen clear-headed men, with a map before them, could have determined upon in the course of one hour. The pamphlet by Mr Arthur W. Godfrey, of Halifax, Nova Scotia, on the subject of the railway, published in 1847, contains nearly as much valuable information as does the report of the surveying officers. And that pamphlet is only one of many that have appeared, in addition to the copious details collected and put in circulation by the promoters themselves. Amongst these may be named the compilation, in 1847, by the Hon. George R. Young, M.P.P., Halifax, entitled "Articles on the great Colonial project of connecting Halifax and Quebec by a railroad, and ultimately the Atlantic and the waters of Lake Huron; with an Appendix, illustrative of the cost, mode of raising the capital, and the returns;" and the recent publication by Major Robert Carmichael Smyth, under the title—"The employment of the people and the capital of Great Britain in her own Colonies, at the same time assisting Emigration, Colonisation, and Penal arrangements, by undertaking the construction of a great National Railway between the Atlantic and the Pacific, from Halifax Harbour, Nova Scotia, to Frazer's River, New Caledonia."* From these documents we learn, that in the country bordering on the shores of the great lakes of Canada, not including the British provinces below the lakes, there are nearly *six millions* of people who would be brought into direct intercourse with Great Britain, and thus a vast reciprocal trade would be produced between the Western States of America and Great Britain. We also learn from them that, (whilst the distance from London to Canton, pursued by ships, is about 16,500 nautical miles,) the distance from London to Halifax, from thence to Quebec, and from thence, pursuing the most direct course to the mouth of the Columbia river, and across the Pacific Ocean to the city of Canton, is between 9000 and 10,000 miles; that, by this means, the Oregon territory would rapidly become a depot for traffic with the isles of Japan, the Chinese empire, the Australian colonies, and all Oceania, embracing a population of nearly one half of the inhabitants of the globe—*four hundred and fifty million souls;* and, "that the project stands no longer a ques-

* Published by W. P. Metchim, 20, Parliament Street, London: 1849.

tion for debate, or of narrow or sordid calculations, seeing it involves the controlling question of national allegiance, and is to settle the mighty issue whether the institutions and forms of local government in Nova Scotia, New Brunswick and Canada, are to continue monarchical, or are to descend and be republican."* To recur, then, to the high eulogium of Sir John Harvey, just quoted, as that was spoken to a handful of individuals, representing a population less than that of Glasgow, we may be permitted to observe, that taking the period at, and the circumstances under, which we write into account, the Halifax and Quebec railway and colonisation project is *second* in its importance to NONE that has ever engaged the attention of the Imperial legislature. And why so? Because, as a frontier means of defence against republican tendencies and aggression in the western hemisphere, the right construction of this railroad will prove a more enduring and impregnable rampart than was that of the great wall of China. Because, as a commercial nexus, it will bind up indissolubly, in one mighty integral *monarchical state*, the scattered component parts of maritime Britain on both sides of the Atlantic. Because, as a colonisation lever, it may be so wielded, on the broadest platform of the New World, as to raise up to comfort and independence the million-masses of destitute poor, whose condition alike weighs down and dishonours the old. Because, as a pauper-farming expedient, it may be so prosecuted, as not only progressively to write "*Delenda est Inopia*," upon the door-posts of every workhouse in the land, but to evade circumstances militant against order, against industry, against morality, such as silently but certainly are effecting *that* within the bounds of the British islands, which Europe, armed and at our gates, would fail to accomplish. And finally, because, by giving free scope to the expansive energies of a race yet destined by Providence so to obey the divine commandment—"Be fruitful and multiply—replenish the earth and subdue it," as to make obedience to the injunction a blessing instead of a curse, it will prove the handmaiden to, and the harbinger of, that coming reign of goodwill and peace, which is to exalt the closing generations of man in the transition stage between time and eternity, which it is less our doom than our destiny to overpass.

From the annexed petition it will be observed that its author points out a mode by which the proposed railway may be laid down—and the vacant territory through which it shall pass settled—on the same principle as was adopted at the plantation of Pennsylvania—viz., by an issue of land notes. To accomplish these conjoint objects, an expenditure of three to five millions is needed. "But," asks Mr Young in his pamphlet, "can this outlay effect

* Mr Young.

either the sober judgment of her Majesty's ministers on the one hand, or of our legislatures and people on the other? It is to secure to the former *sovereignty in the West;* fighting-ground to curb and control an ambitious and haughty rival; a growing nation of children as customers; a home for surplus population; a new sanctuary for the free institutions of the old world; a fresh field for practical arts; another, and a living reflex of the laws, literature, science, and discoveries with which our ancestors have illustrated the past brilliant history, and adorned the present condition of Europe: and on the other, the protection and security of the British flag—sympathy with British interests, the glorious inheritance of British freedom—the life and impetus of her inimitable constitution; a preference in the British markets; and a friendly brotherhood and relationship in all she is yet to achieve." Again, this expenditure is demanded at a moment when, according to the *Liverpool Mercury*, the emigration from the Mersey last year (1849) amounted to the extraordinary number of 153,902 persons, of whom no less than 147,745 went to the United States, and only 4630 to British North America.* It is demanded at a moment when the emigration from the Clyde last season exceeded that of any former year, it having reached to a total of 14,986 souls, whose destination has been 10,636 to the United States, 3391 to Canada, 691 to Australia and New Zealand, 124 to the Cape of Good Hope, and 144 to the East and West Indies;†—at a moment when the Russian government is seeking a loan in our money market of £5,500,000, for which 4½ per cent is offered;—when money is so abundant that it can be had for short periods at 2 and 1½ per cent;—when the bullion in the Bank of England is £17,080,642, being £441,327 in excess of the highest sum it has ever previously reached.‡ Demanded, when the *Times* on the one side, in leading articles, is attributing the lamentable state of the Irish people to, amongst other causes, "their not having passed through the ordeal and discipline of the regular *feudal system;*" and when, on the other, that great organ of mammonism is opening its columns to such observations as these—"Hence domestic miseries, heart-rending bankruptcies, gentlewomen left by insolvent fathers to boast in humble servitude of better days, ingenious youths thrown upon the world to contend with it in the spirit of bitter foes. Hence, too, the starvation that glares upon us from the holes and corners of the world—holes in which men, women, and children labour for a crust through the long hours of day and night, that some prosperous, sleek, and 'universally respected' tradesman may minister to *an inhuman love of cheapness* and fatten upon the flesh and blood of his obscure and

* [illegible] *Advertiser*, 15th Jan. 1850.
‡ [illegible] 1st Jan. 1850.

helpless fellow-creatures. Enough! money-worship, let us not deny it, *is* a national sin, and he deserves well of society who makes it the subject of his written thoughts, whether he speaks in prose or verse."* Demanded, when Lord Lyttleton is lecturing upon the subject of the colonies to the people of Birmingham, and is showing that the prevailing evils there "are an excess of *the democratic and of the money-getting principles*, but that there is yet ample room for the victory of good."† And, finally, it is demanded, when we are told that "just now the best argument that could be imagined for any conceivable project is, that there is leisure to do it—because there is nothing else to do."‡

Before concluding this article, there are some specialties in the project upon which we write, as regards Scotland, to which we wish pointedly to advert. The surveying officers have observed in their report, as already cited, that "for any *great plan* of emigration and colonisation, there is not another British colony which presents such a favourable field for trial as New Brunswick. To 17,000,000 of productive acres there are only 208,000 inhabitants; of these, 11,000,000 acres are still public property." From a general review of the topics brought together by us in this and the two previous papers, entitled "The Nova Scotia Question," and "Scottish Agricultural Resources, and their Neglect in the Western Hemisphere," it will be seen that we propose that Scotland should make the grand work of settling *New Scotland* an enterprise peculiarly her own. Does the fact stand out in history, that, by means of the Ulster Baronetage, and the City Livery Companies of London, James I., in the short space of *nine* years, did more "to establish so great a province of the empire as Ulster that should more and more flourish, not only in the true practice of religion, civil humanity, and probity of manners, but also in the affluence of riches, and the abundance of all things which contribute either to the ornament or to the happiness of the commonwealth," than all that his predecessors on the throne of England had effected by the bayonet and sword during the *four hundred and forty years* which had elapsed since the conquest of Ireland was first attempted? And is there one man in Scotland who can deny that similar great results, in a few years, would flow both to the colony and the mother country from the restoration of Scottish Baronetage rights, and the discharge of Scottish Baronetage duties? No man of probity and sense—none truly desirous to ameliorate the destitution which is prevalent throughout the length and breadth of our fatherland, can say with justice that any valid reason exists why the views of those that direct the *Baronetage movement* should not prove triumphant. Compare with such mea-

* *Times*, 14th December 1849. † *Morning Chronicle*, 28th January 1850.
‡ *Times*, 24th January 1850.

sures of statesmanship the propositions involved in the "Memorandum and Protest" placed in Earl Grey's hands by the Committee of Scottish Baronets, embodied in our second article, and the propositions involved in the Petition annexed to this, and then let these ranks and classes in Scottish society upon whom devolve the maintenance of the public prosperity, the social welfare, and the moral improvement of the nation, well consider whether they are doing their duty by the present generation, or by those which will succeed, to stand aloof from such a practical mode of dealing with the said propositions as shall render them productive of general good. If it follows that the restoration to our baronets of two and a-half million acres of soil in New Brunswick would give to them collectively, in ten years, at £5 per acre, no less a sum than £12,500,000 sterling, every farthing of that money will be well appropriated, if the result shall be the re-creation in Scotland of a state institution which shall do for Scotland, in the new world, that which the English Baronetage did for Ireland in the old.

We make this remark at a moment when a paragraph is making the round of the Scottish press, to the effect that a second meeting of poor-law delegates, from counties and parochial boards, has just been held in Glasgow, the chair being filled by one baronet—Sir John Maxwell of Pollock; and the meeting addressed by another—Sir George G. Suttie. Look into the *Edinburgh Almanac*, and between the names of these "*poor-law delegates*" there will be found those of thirty-seven other baronets, beginning with the letters M, N, O, P, R, and S. Multiply the 16,000 acres, which belong to each of these baronets in New Scotland, by thirty-nine, and there are 624,000 acres of virgin soil within eight days' distance from the Clyde—a quantity sufficient to make twenty new parishes of 3000 acres each—upon which county and parochial boards may develop their pauper-farming energies. The late Lord Metcalfe, when Governor-general of Canada, gave to Sir Richard Broun, and the promoters of the Halifax and Quebec railway and colonisation project, this promise in reply to their memorial in 1845—"You may rely upon this province for whatever protection and aid it may be consistent to render to the undertaking." The brother-in-law of Sir John Maxwell, the Earl of Elgin, now stands in Lord Metcalfe's shoes, and his opinions upon this matter we have already quoted. Would there then be any impropriety if another meeting of the said poor-law delegates would take steps to make the whole people of Scotland parties to such proceedings, during this session of parliament, as shall concuss the government (should it be needful) into an equitable adjustment of the Baronet Claims-of-Right? We have spoken already of the emigration from the Mersey for 1849 ... emigration from the Clyde for the last six years has been ... In 184[illegible] [illegible]568; in 1845, 3445; in 1846, 2820; in

1847, 7728; in 1848, 10,035; in 1849, 14,968; grand total, 42,554 souls. Truly we may say "*vires acquirit eundo.*" Of the emigration in the year just closed, 10,636 of our countrymen went to swell the population of the United States, and only 3391 to our own possessions in North America.* Under the banner of the baronets, had that been erected on the fertile plains watered by the tributaries of the Miramichi river, at the period of the commencement of their proceedings, the frightful ravages of two famine visitations would have been mitigated for thousands of our poor, loyal, and industrious clansfolk; and, in addition, there would have been formed upon that *key-stone of British sovereignty and power*, on the American continent, the germ of a community which would perpetuate the monarchical institutes of Scotland on that rallying point whilst time endures. We have lost, however, some irrecoverable years—we have omitted two great occasions—for doing in this cause what it is all-important to accomplish. Let us hope, however, that the seeds of thought planted during the interval will ere long spring into fruition—it is not such seeds that ever produce *armed bands*.

In these three articles the writer has travelled over a great variety of ground—has brought together many statistical facts—and has furnished thought for all classes of Scottish subjects. Writing, as he professes to do, for the specific object of giving an onward impulse to the steps which our baronets are taking for the recovery of their patrimonial rights—it may be thought by some of the readers of this journal, that the questions he has handled scarcely fall within the scope of a periodical devoted exclusively to agriculture and matters bearing upon it. Before closing a series of communications of which this is the last, he may be permitted to remark, that it is apathy and indifference, more than ignorance and shortsightedness, that obstruct the progress of mankind. Whoever, then, in the pages of any publication, daily or quarterly, propounds that which is calculated to break up supineness and negligence, in the ranks of the landed aristocracy, is more or less a public benefactor. The writer of this, without having any interest in a foot of Scottish soil, or even receiving on account of his labours so much as the price of the shoe-leather which he expended through years of continuous toil, considers he rendered to the cause of *British agriculture* services as important as those for which, in regard to manufactures, one leading character has pocketed many thousands; and whilst that gentleman was as yet busied with his looms, another was occupied with his amusements, and a third was engaged in writing those novels in which he hounded on the "go-ahead" propensities of the power-loom men, the writer of this unfurled the standard

* See *Greenock Advertiser*, 15th Jan. 1850.

of the agricultural cause in the once regal halls of Framlingham—propounded the doctrine, by legislative means, "1st, Of a liquidation of all the imposts, affecting the price of food, which constitute rent, over and beyond that portion of it which goes into the purse of the landlord; 2d, Of an alteration in the existing system of acquiring wealth—a system which exceeds in enormity every other evil that bears the name of fraud; and 3d, Of compensating the industrial classes for that capital which the operation of Peel's monetary act of 1819 unjustly abstracted;"—built up the noblest society for agricultural encouragement and protection ever founded in the United Kingdom; compelled the introduction, into the speech from the throne in 1836, of a clause recognising the existence of that overwhelming distress which then threatened to engulf landlords, tenants, and labourers, in one common destruction—and procured committees of both houses of parliament to investigate the causes of the said distress. At this moment there was peace in all the cotton-spinning border. The corn laws were in full operation. Importations of foreign grain, for three years previous, had not exceeded 82,346 quarters in 1833, 64,653 quarters in 1834, and 28,483 quarters in 1835; and yet wheat had sold for 36s. per quarter, the average prices during the last three months of the latter year being respectively, 36s. 11d., 36s. 7d., and 36s. Well, then, what was the issue of this great confederate movement of all the classes owning allegiance to the British plough? We will answer that question by a reference to arithmetic. The income of a society, called into existence to watch over the interests of property, calculated to be not less in value than £3,258,910,810 sterling, and producing a gross annual return of £539,036,201, was, for the first year, £948, 4s.; for the second year, £512, 11s. 9d.; and, for the two last, £306—in all, £1756, 15s. 9d. Contrast these with the subscriptions placed at the disposal of the League—first year, £14,000; second year, £50,000; third and fourth years, £350,000—total, £414,000. The writer of this article can say experimentally of all the agricultural movements, within the last fifteen years, that they have been organised non-entities. . . . Why do we recall these sentiments? to give practical effect to the opening observations in our first article, which we consider will bear re-quotation:—"In times such as these of free trade, of financial reform, and of population redundancy, *commonweal concerns*—new and old—will successively arise, imperiously to demand the general regard. Nationality of sentiment, long dormant, will again perforce predominate. The links of Scottish social life, of feudal attachments, will be resoldered; and great questions of household benefit, of universal aggrandisement, will concentrate attention. The *Meneniuses* of the 19th century will not altogether labour in vain to convince the state that agriculture is to the body politic what the belly was to the mutinous

members. Nor will the doctrine prevail that 'man lives by *bread* alone.' And certainly the movement of the power-loom school will not be wholly unblest should they have the effect of stimulating each rank and condition of men more fully to attend to their own *special* interests. It is the individual wellbeing of classes that makes up the sum-total of aggregate public wealth. To the improvidence of classes is to be attributed those enormous evils in population-condition which form the master-difficulty of the age in which we live. A practical disregard of the golden rule—'Each aid the others,' has led, within the last eighteen months, to all the revolutionary convulsions which we have witnessed in Europe. Of late the conflagration of a neighbour's home has directed attention from the smouldering embers which are consuming the foundations of our own. *But let us now take heed!* At this moment the British nation is engaged in as stern a social conflict as that which overthrew the throne and the aristocracy two centuries back. Only hitherto, the printing-press, the platform, the hustings, the floor of St Stephens have been the battle-field—and tongues, type, ink, paper, the weapons of warfare. What will be the issue of this contest of opinions—of this struggle, this jostle, this war for common subsistence—is what no man living can tell. But each and every man is responsible for that issue; and woe be to all should it not prove a happy one!" . . . .

In our own fatherland, there are three men labouring beyond their fellows to do for their country and their kind transcendant acts of beneficence and patriotism. We refer to Sir Richard Broun, who, through good report and bad report, is engaged in impelling forward, with the energy of a fixed resolve for success, the Nova Scotia Baronetage question; to the Rev. Dr Begg, who is boldly taking the field against those prominent social evils, which, unless now arrested, will destroy the whole framework of Scottish life and worth; and to Mr Isaac Buchanan, whose statesmanlike opinions upon reciprocal free trade, and views on currency, will not be dissented from by any who desire to avoid *colony loss* and *imperial destruction.* If, then, the influential bodies in Scotland with whom these gentlemen are, or ought to be, respectively allied—namely, the landed aristocracy, the Free Church ranks, and the mercantile community—can be brought together and made to understand their relative obligations and common policy, greater things may be done for Caledonia, within the space of the last one-half of the 19th century, than all put together which has been achieved for population wellbeing since the Union. For out of such an intelligent and religious confederation, there would certainly arise some modern Joseph, who, reversing the worse than Egyptian bondage system of "making bricks without straw," would put *cheap money* as well as *cheap corn* into every man's sack;—some Christian-minded Moses who, bridging the Atlantic in such a mann

as not to make it a Bridge of Sighs, would lead forth, from our wynds and alleys, our gaols and workhouses, thousands and ten thousands of the idle and impoverished, to occupy the spacious and goodly plains of our inheritance in Scotland in the western world;—some monarchical Cromwell, who, breaking up the lethargic somnolence that prevails in high hereditary institutes, will breathe new life and vigour into their dry-bones, to the end of their exercising an enlarged utility throughout all the future generations of the British race. As regards, in especial, the banner of the *colonisation cause*, we feel assured it will not go backward. And shortly we hope to see it surrounded with all the bright-minded and high-hearted in what was once fondly called, and will again be called—"the Land of Cakes and Brother Scots." What a noble and glorious nation the Scottish people will become, when the Atlantic, and not the Tweed, becomes the *union-stream* of monarchy. The formation of this great proposed highway between her eastern and her western capitals, will, under the auspices of a paternal Government, prove an exodus for the destitute of our compatriots from the slaughter-house of pauperism—for the over-laboured white-slave from those manufacturing lazars where the billy-roller and a ten-hours' bill are the presiding genii—for the unemployed, the poverty-stricken, the oppressed amongst us, from a tyranny of hunger, nakedness, disease, wretchedness, such as society under heathen yoke never endured. A course such as this, by a threefold combination of mind, means, and energy, will uphold the due grandeur of the throne—will illustrate the utility of an important section of our titled nobility—and will maintain on its ancient relationships the integrity of the empire. But it will do more than all these. It will for ever obliterate, so far as our British North American possessions are concerned—the disliked word—*emigration*. It will diffuse Great Britain, in all her essentialities, from the German sea even to the Pacific Ocean. And within the mighty bounds of this old and of this new monarchy, it will for ever cause "*peace, opulence, and prosperity*" to abound.

COLONISATION.

HALIFAX AND QUEBEC OR ANGLO-CANADIAN RAILWAY AND COLONISATION PROJECT.

*Copy of a Petition presented to the House of Commons, on the 14th February 1849, by the Right Hon. Lord Marcus Hill, M.P.**

Unto the Honourable the Commons of the United Kingdom in Parliament assembled, the humble Petition of the Hon. SIR RICHARD BROUN, Bart.,—

Sheweth,—That, in the year 1833, your petitioner presented a

* Taken from *The Colonial Watchman* (St John, N.B.,) 19th December 1849.

memorial to the late Earl Grey, then First Lord of the Treasury and Prime Minister, embodying a proposal for consolidating the internal elemental transit of the country, and making the conveyance of persons, letters, and goods, a joint source of revenue to the state.

That this proposal was urged upon the attention of the Grey administration, on (*inter alia*) the following grounds:—" Because the system of government allowing individuals to reap the enormous wealth which new inventions produce has been highly detrimental to public wealth, industry, and contentment; because it would provide for the public safety, which would infallibly be endangered if steam locomotion was left to the competition of rival companies; because it would greatly and judiciously extend the patronage of the crown, without compromising the rights of the subject; and because, by progressively admitting of an extinction, not conversion, of taxation, it would diffuse public wealth and public satisfaction."

That the railway legislative principle involved in the proposal submitted by your petitioner, was—1st, In accordance with the views of Dr Adam Smith, who was of opinion that the roads of a country would be better attended to, and more economically managed, were they placed under the control of the government; it was, 2d, supported by the writings of Mr Grahame, who lays it down in his valuable treatise on *Internal Intercourse*, that, " indeed, were it desired to frame a system of intercourse purposely calculated to sap and destroy the prosperity of a country, no device more effective for that purpose could be suggested than that of carrying on internal communication by means of stock-jobbing companies;" and was, 3d, enforced by the following axiom in social ethics, which was then, as it is now, vindicating its supremacy,—" a proper distribution of the resources of a state is absolutely necessary to the integrity of its existence, because the neglect of it must terminate either in anarchy or despotism."

That your petitioner's proposition, at the time, received the support and advocacy of the public press of every shade and complexion of politics; whilst, fourteen years later,—viz., in 1847,—the *Times*, in a leading article, has observed, " There are certain principles of conduct in railway matters which discussion and experience have now invested with the unchangeable attributes of truth, and which will hold good under all governments, and in all countries of the world. A highway should be for the good of the public, not for the profit of a company. The primary object of those intrusted with its care should be the facilitation of traffic, not the increase of its returns. The results and improvements of a mighty discovery should successively go to benefit the public, not to swell a dividend. The government should not grant or not lose hold of a power so pregnant with all the mischiefs of monopoly; mischiefs the more incalculable from the magnitude of the measure, and from the

culty of foreseeing the abuses into which authority so vast, and opportunities so unexpected, may hereafter develop themselves."

That, had your petitioner's proposition been adopted by government and acted upon, we should to-day have had a cheap, rapid, well-regulated state system of railway conveyance, bringing in yearly to the treasury a larger return than what the income-tax produces—the railway receipts for 1848 being £10,065,170, one-half of which is, or ought to be, clear profit. Ten millions of turnpike trust debts would not have existed wholly unprovided for. We should not have had upwards of 889 Railway Acts, the passing of which has exhausted, session after session, an immense proportion of public time, and entailed under the one head of parliamentary charges alone, expenses which have varied from £950 to £3000 per mile. Railway corporations would not have existed, authorised to expend on different lines sums to the incredible amount of not less than £350,000,000 sterling. The railway mania, and railway panic, of the last few years would have been unknown, causing an amount of ruin and bankruptcy throughout the United Kingdom, which may be surmised from the fact, that the depreciation of railway stock about the middle of November last was then estimated, by the Manchester shareholders, at upwards of £120,000,000; that is, one-sixth of the national debt. A new and portentous moneyed power would not have sprung up in the state, having already 105 votes in the House of Commons; nor would a system of acquiring and amassing wealth have been in virulent, unmitigated operation, which throws far into the shade of obliquity the mammon practices which have come down upon us from past ages.

That, in the year 1845, your petitioner, and others, brought under the attention of Sir Robert Peel, then prime minister, a project which contemplates eventually a direct line of steam-boat and railway communication between Great Britain and Asia, *viâ* the British North American Provinces, but which project in the first instance is limited to the construction of a railway from Halifax to Quebec, and the systematic settlement and colonisation of 300 miles of vacant crown territory in Nova Scotia, New Brunswick, and Canada, through which it will pass. That in consequence of further steps and proceedings in the matter by your petitioner and his associates, the government sent out, in 1846, a party of engineers to examine the country and to report upon the same; and that, after an interval of two years and a half, during which the said surveying party has been engaged in this service, they have recently made their final report to the Colonial Office on the line.

That your petitioners and others, the originators of the project, are now engaged with the work of forming a public company to carry it out; but from the magnitude of the undertaking, and in consideration of the numerous evils that would necessarily flow from the introduction into the British North American Colonies of railway system similar to what prevails in the mother country,

they have submitted to ministers certain propositions, the adoption of which would so far make the project a state measure, as that government would have a direct participation in the management, patronage, and returns of the company.

That, considering the want of confidence felt by British capitalists in North American undertakings, from the disaffection produced in the colonies by free-trade measures, the total want of means possessed by the inhabitants to execute of themselves so large a public work, the necessity that exists for a constant emigration from the United Kingdom, the policy of introducing such a regulated plan of colonisation in Nova Scotia as originally bounded, (which comprehends all British North America south of the St Lawrence,) as shall infuse into it these stable elements of British society—a landed aristocracy, a yeomanry, and a peasantry—it would be a wise and judicious thing for parliament to grant to the proposed company the privilege of making this railway, building a central town midway between Halifax and Quebec, and settling such territory as it may acquire by grant or purchase, by means of *land notes*, on the same principle as was adopted at the plantation of Pennsylvania, when, to cite the language of Hume the historian, " the land itself, which was the principal commodity, was *coined* and passed into circulation."

That the adoption of those suggestions, and the revival of the chartered rights and privileges of the baronets of Scotland and Nova Scotia, within the provinces named, would be attended by these results: it would diffuse British institutes, British society, and British feeling over that part of our colonial empire, which must ever be the *arx et domicilium* of British sovereignty in the western hemisphere; it would re-tie and indissolubly unite the loosened bonds of the mother-country and the colony; check the existing system of making wealth, a system that has gone far to divide society into two extremes—usurers and paupers; and extend the currency by making land a standard of value as well as gold:—results which would go far to remedy most of the evils in our population condition, and indefinitely promote the opulence, prosperity, and peace of the British nation on both sides of the Atlantic.

That the interposition of the Imperial Parliament in this matter is the more loudly called for, inasmuch as the Colonial Office has for some time past been acting on the principle that the British legislature has no say or voice in the disposal or administration of a single acre of land in our North American colonies, the same being entirely in the hands of the local executives; whereas the due location of the unsettled lands in these colonies, still exceeding ninety millions of acres in all, is an unalienable prerogative of the Crown, and so within the legislative supervision and control of the Imperial Parliament. Further, this interpretation is necessary, in consequence of the *Memorandum* recently placed in the hands of

the colonial minister by the committee representing the interests of the baronets of Scotland and Nova Scotia, asking two and a half millions of acres in New Brunswick out of the 12,300,851 acres there still waste, in lieu of their joint territorial claims; and protesting, until such time as the said claims are equitably adjusted, against the sale, grant, or disposal of any of the unlocated lands within any portion of the royal province of New Scotland as originally bounded.

That since the project of a direct steam navigation and railway intercourse between Great Britain and the Canadas suggested itself to your petitioner in the close of 1844, the legislature has passed railway bills, in 1845, for £61,357,373; in 1846, for £128,986,714; in 1847, for £38,007,233; in 1848, for (about) £14,000,000—total, £242,351,320; whilst, within the same space, there has been an unregulated, unaided, unprovided-for emigration, in 1845, of 93,501 souls; in 1846, of 129,851; in 1847, of 224,251; in 1848, of 220,053—total, of 687,656 souls.

That the returns made by the emigration officers show, that of the emigration in 1847 upwards of 25,000 persons died either in the passage out, or immediately after landing; whilst the mortality, under similar circumstances in 1848, exceeded 13,815—an amount of national blood-guiltiness alone exceeded by the inordinate cupidity which the above railway figures display. Further, it appears that out of 129,576 persons who emigrated last year from the port of Liverpool to America, only 2066 settled in our own colonies.

That these statistics, and the other circumstances above adverted to, render the policy, justice, and humanity of the practical adoption of the suggestions thrown out by your petitioner, with reference to the project in question, too obvious to require any additional argumentative observations. Wherefore your petitioner prays your honourable house that a motion may be made for returns of copies—1st, Of the memorials to the prime minister in 1845, and to the Queen in council in 1846, upon the subject of the Halifax and Quebec Railway and Colonisation Project, together with the memorandum placed in Mr Gladstone's hands whilst colonial minister; 2d, Of the report of the examination of the line made to the colonial office by the surveying party of engineers;—and 3d, Of the memorandum and protest placed, in May last, in Earl Grey's hands by a deputation from the committee of the baronets of Scotland and Nova Scotia; and that the whole of these documents, together with the subject matter of this petition, may be referred for the consideration of a select committee of your honourable house to consider and report their opinion upon the same.—And your petitioner will ever pray, &c.

R. BROUN, Bart.

THE BEST CULTURE OF BARLEY IN ENGLAND.

By Thomas Rowlandson, Liverpool.

In the following remarks on the management of the barley crop, he reader is informed that the writer has confined himself to that nanagement only which he deems the best adapted for its profitable cultivation. The mode recommended is that followed in some of the best cultivated parts of Lincolnshire and the eastern counties of England, but is by no means general even there.

The writer is afraid that the description of opening and closing the furrows, as herein described, may appear somewhat obscure, the English not having any term to express that double operation, the Scotch having a particular word for the opening of the furrow, (feering.)

The land best adapted to the growth of barley is a rich, free, hazel-coloured loam, incumbent on a subsoil or rock which is sufficiently open to permit the free egress of water. The soil should be at least of moderate depth, notwithstanding there is no crop grown by the farmer that will succeed so well on light lands of little depth as barley, or, when once the ground is well covered, suffers comparatively so little from drought; whilst not so obnoxious to excessively dry weather, no cereal crop suffers so much from the presence of stagnant water. In barley culture, perfect drainage is therefore a *sine qua non.* Next to loams as described, gravelly loams and sandy soils, such as the well-known, dark-coloured, sandy lands of Norfolk, are well adapted to the growth of barley, provided they are in good tilth. In moderately dry years we have seen excellent crops of barley on heavy clay soils: such soils are not, however, naturally well suited to its growth. Clays, much mixed with calcareous gravel, or chalk, if drained, are well fitted for the culture of this crop: the latter soil would, however, be perhaps more properly classed as a stiff calcareous loam. Chalks, downs, and wolds will yield good crops of barley, provided the succeeding summer be moderately showery, and the soil has been previously well pulverised and in fair heart.

Of the soils enumerated, no one is so obnoxious to the growth of barley as stiff clays; and this mainly arises from the difficulty of getting clays into that finely pulverised state which barley so much luxuriates in; and if too finely divided, the clay is apt to run into a compact mass on subsequent showers of rain falling: in this case the prospect of a good barley crop becomes annihilated. If the season should prove so far favourable as to permit the clay being made *moderately* pulverulent, (the best form of tilth for this crop on clays,) and a lucky seeding time follow, a good crop may result; notwithstanding all these supposed favourable circumstances, the quality of the crop is likely to be seriously damaged if the latter part of the season proves wet, as in such cases the crop continues

green for a long time, and displays no symptoms of ripening during the continuance of wet. Clays, however well drained, being naturally disposed to retain moisture, in consequence of the more abundant presence of alumina therein, render them in moist years adverse to the growth of barley. Beans, clover, and wheat are the legumes and cereal adapted to clays — barley is the cereal peculiarly suited for porous, light, and dry soils. Bog, or turf land is ill suited to the growth of barley, for a similar reason to that assigned, on taking into consideration the adaptation of clays to its growth—viz., the too great predisposition in wet years to retain moisture, in consequence of the capillary attraction arising from the minute interlacement of the roots composing the staple of these soils.

Preparation of the Land.—Barley, in the ordinary course of husbandry, is a peculiarly favoured crop, in the majority of instances succeeding a crop of turnips, rape, &c., which has been previously eaten off by sheep. In a general way, however, barley is made to succeed turnips, and oats rape so eaten off. It is not an uncommon practice, in some places where a backward state of husbandry exists, for barley to succeed a fallow; in others a crop of potatoes; generally, in the latter case, upon a poor thin soil, which has not received much manure for the potato crop, and consequently deemed too poor for wheat. We shall, in the first place, notice that practice which is adopted by the best agriculturists.

If the turnip, rape, &c. crop, previously eaten off by sheep, has been grown on the flat, the ridges ought to have been set out prior to the green crop being sown. If the green crop has been sown in drills, the more usual and approved manner, the first preparation of the land should commence by setting out the ridges. In doing this, the ploughman should take two light poles, 11 feet long each, one for each end of the ridges. If the land is uneven, three or more poles will be required, to be set up in like manner on the line of the furrow intended to be drawn out. These poles are termed beacons, and should be exactly 11 feet long each. These beacons should have a mark exactly in the middle, so as to measure 5 feet and a half from the side of the field where the ridging begins. This being measured, the poles are set up, and the ploughman proceeds to draw a straight furrow to the opposite end beacon; which being done, he must *hie his horses* into the same furrow, and turn up the land side. This is called opening the ridges. This being done, he must now take the poles and measure 11 feet from the beacon where he originally set out, and thus proceed throughout the field. These full ridges are called rounds for the drill. In good-sized farms this is done by one ploughman, who is followed by another who executes the ordinary ploughing. When, however, only one plough can be used at a time, this opening of the ridges should be completed throughout the entire field prior to

proceeding with the next operation. Where a choice exists, the opening of the ridges should always be given to the best ploughman on the farm.

The ridges being opened, the second plough proceeds to close them. This is done by commencing at the *same* side of the field, and same end, at which the previous ploughman commenced opening the ridges, and is accomplished by going over the same lines that were gone over by the preceding ploughman in opening the ridges. In doing so, however, the second ploughman must always turn his horses sharp off at every furrow, and set the plough of sufficient depth to turn over the soil 4 inches below the furrow-slice turned over in opening the ridges, as previously described. By this means the right and left furrows are returned to their original position, with a new furrow-slice on the top of them. In this way the whole of the land becomes softened. The last-described operation is called "closing the ridges." The ploughing now proceeds in the ordinary manner, taking a furrow-slice of an even depth of 4 inches until he arrives at the last turn or bout, which will be at the sixth or seventh round, according to the width of the furrow-slice taken. At this round it is usual with a good workman to take a furrow not more than 3 inches deep on the land side, in order to prepare for taking up the next, or what is called the *mould-furrow*. The mould-furrow is taken up by setting the plough 2 inches below the level of the land forming the sole of the previous furrows, which, with the 1 inch of soil left above the level on the land side, will form a furrow 3 inches deep, which is thus taken up by the plough going over the same ground as it did in taking up the last furrow of the round on the land side. Care must be taken that these mould-furrows are all taken up one way of the field: the ploughman thus proceeds throughout the field. A neat farmer will take care that the ploughing is continued close up to the hedges or ditches; and where the plough cannot conveniently be used, he will have such places dug up, so that no weeds will grow. This gives field-culture all the neatness of a garden: the additional crop will pay for the extra culture. Nothing is more unsightly, and gives the appearance of slovenly farming, than thistles and weeds growing at the sides, and on broad dirty headlands. The preceding particulars being carefully attended to, and executed by a good workman, the ridges will appear of an equal width, and present a neat appearance. The ploughing having been performed, the ridges must be broken down the first fine weather, with good harrows. According to the nature of the season and land, this will require two or three bouts up and down the ridges. Some light barley lands will break down at once. On this point the farmer will of course rely on his own experience, it being impossible to give instructions on this matter for all soils and all seasons. The weight of the harrows required will also depend on the same cir-

cumstances. Light harrows are commonly used for this purpose. If requisite, they can be weighted. Whatever weight may be deemed necessary, two or more ought to be yoked together, and the horses yoked to the harrows, one to the corner of each. The horses are to walk up and down the furrow, each horse in separate furrows, particular care being taken by the harrowsman not to let the horses walk on the pulverised soil; as on some lands, wherever the horses place their feet, the soil sets like mortar, and when dry weather occurs, will be found so hard that the roots of the grain cannot penetrate through such places.

The soil being so far prepared, it is in fit order for the drill. It may be here incidentally observed, that the management of the drill is not so well understood by farmers, even in counties where the drill is much used, as by their labourers; and still less is the mode of using this valuable implement, about to be described, known through the major part of the kingdom. In order to keep the horses, in drawing the drill, from treading on the pulverised soil, the shafts of the drill should be placed on the sides, for which purpose bolt-holes, bolts, and fittings are purposely prepared, so that the horses can walk along the furrows. For carrying out this point efficiently, the horses are harnessed one before the other. For barley, the coulters of the drill should be set 6 inches apart. Sufficient weight must be placed on the drill to press the coulters 2 inches deep into the soil, there to deposit the seed. Care must be taken that the seed is not placed deeper: twelve pecks of barley per acre is a sufficient quantity of seed with the drill. The drilling being finished, it must be followed with a pair of light harrows, yoked together, as before mentioned; to cover the seed, the horses in all cases walking down the open furrows. In order to carry away the surplus water as quickly as possible, a plough, drawn by one horse, should pass along every furrow that separates the ridges, opening the stream as deep as may be deemed convenient or useful, whether the land has been thorough drained or not. Opening the furrows in order to carry off the surface-water is necessary in barley culture, as excess of moisture is obnoxious to the growth of barley more so than any other of the cereals. The body of the field having been thus attended to, the headlands must be treated in a similar manner; after which the field will present the aspect of garden culture, the ridges and drills appearing in straight and equidistant lines, forming a handsome appearance from the time the seed is covered until it is fit for the sickle. Some persons are of opinion that the land is too hard for barley after a green crop has been eaten off by sheep. If so, it will generally be found to occur in such cases on stiffish clays and marls—land not naturally adapted to barley, and which can more profitably be sown with wheat, beans, or oats. Where two ploughings are deemed a necessary preparation for the barley crop, the ridges may be formed by

the ordinary gathering mode, the subsequent operations of harrowing, drilling, &c. being executed in the manner previously described. This remark also applies to sowing barley after a fallow. The bulk of the farmers of Great Britain do not use the drill, but sow the seed by hand. To such, however, the directions, with respect to ploughing and harrowing, equally apply, and may be advantageously adopted. The benefits arising from the practice recommended is, that the whole of the land is made light and porous for the reception of the seed. In harrowing and drilling, the horses are entirely kept from treading on the fresh turned-up soil, with the slight exception of the land horse partly treading on one side of the ridge in taking up the mould-furrow. A *very neat* farmer obviates this by taking up the mould-furrow with a single horse. When the last-named mode is adopted, the operation is perfect.

As barley usually follows a green crop that is consumed on the land, it is rarely requisite that any additional manure needs to be given. When barley follows a naked fallow on poor land, it may require a dressing. In such case it can be given either broadcast or by the drill. A broadcast top-dressing is the best mode. This, however, will greatly depend upon the manure employed. If farmyard manure is used, it ought to be ploughed in shallow.

Advantages and risks of early sowing.—Farmers, who have been sufficiently observant in following their vocation, can have but one opinion on this subject—viz., that, as a general rule, on what are technically called barley lands the advantages of early sowing greatly preponderate over late seeding. Only on one kind of land is late sowing comparatively advantageous—viz., stiff soils; and as these soils are not naturally adapted to the growth of barley, their consideration might fairly be left out of the question. As, however, the physical circumstances connected with the prejudicial effects which may occur to the barley crop, if sown at an early period of the season on stiff soils, are calculated indirectly to explain the reason why it is injudicious on sown lands to sow barley early, we will here enter on the subject. It has already been stated that barley grows best on a light, open, friable soil. On the other hand, it is well known that it is exceedingly difficult to convert stiff clays and marls into that fine pulverised state which is adapted to the growth of barley. Or if the season is so favourable as to permit this being done at an early period, the chances are, that, before the barley has attained sufficient strength to push its roots into the stiff soil, the whole will run together into a mass, through the rains which fall before the genial growing weather of April and May arrives. Should such land, from the circumstance named, "set" before the grain has penetrated the soil, the chances are greatly against its ever effectually germinating; for, whilst there is no grain that springs up so quickly as barley after sowing under favourable circumstances, there is none that perishes or suffers so much under

unfavourable ones. If the latter occur, the consequences are seen in a deficiency of plant, which is not adequately made up by "tillering out." In fact, if very dry weather sets in after the clay has run together, the barley will not tiller at all, the result being a deficient crop. Under favourable circumstances, excellent crops of barley can be obtained on heavy soils. These circumstances consist in sowing barley about the two first weeks of April, when sufficient rain almost invariably falls to promote the growth of the plant, yet not sufficiently heavy to cause the land to set. When barley, sown on strong land, has once got about a foot high, it is pretty well out of danger from the weather, as it will generally find sufficient moisture in clays and other stiff soils adequate to its growth, even if drought sets in. Undrained stiff soils always set easier by a superabundance of rain than similar soils drained. Such impermeable soils ought never to be sown with barley. If undrained, the disadvantage of sowing barley late—that is, the latter end of April and beginning of May—on stiff soils is, that if the autumn proves wet and unfavourable, the crop remains green so long that it will run serious risks of being laid, getting discoloured, and eventually having to be gathered in an immature state. On open soils, in fair tilth, barley may advantageously be sown, commencing in the last week of February, and ending about the 21st of March. If the succeeding season proves dry, no seed time is so favourable as the time named, for in that case a good crop may be calculated on in the July following. If the season proves wet, the earlier sown may perhaps suffer through deficiency of plant. Barley suffers greatly by excess of moisture—nothing from frost. The damage done to barley, and so frequently attributed to frost, will be found, on strict investigation, to be due to excess of moisture; as what can possibly be more injurious to a grain, otherwise so delicate in its earlier stages of growth, than growing in a soil continually saturated with water? When a smart frost occurs, on a soil so situated, doubtless the frost aggravates the injury caused by the superabundance of moisture; but if the land had been comparatively dry, the frost would have proved innocuous. To escape extremes, any danger arising from too early sowing, or too late, on fine warm barley lands in good heart, on an average of years, the best time of sowing will be found to be during the last week of March and the first week of April; but the common practice on such land is not to sow barley until mid April—often in May; and I have known good crops obtained which were sown the first week in June; but when sown late, there arises great danger to the crop from an unfavourable autumn. For sowing barley, the following general rules may be laid down—viz., On light gravels and sands, in moderate tilth, and from which the water freely passes away, as early sowing as the last week in February and the beginning of March is to be recommended. Barley so sown will, in a favourably

dry season, be fit for cutting in the middle of July.* If an unfavourable season, it will be ready to cut the first fine harvest weather. By sowing early on these soils, it gives the grain the opportunity of maturing at a period of the year when the sun is at its highest and most maturing power. If sown late on such soils, the harvest is retarded to a late period, when the sun has less maturing power, in consequence of which the grain becomes shrivelled. As a general rule, within moderate limitation, it may be laid down, that in proportion to the fertility of the soil, whether natural or produced artificially, the sowing of barley may be delayed with advantage until, and may be continued through, the month of April, by which means the crop will occupy the ground only during the very best part of the growing season, though we have always seen the best crops obtained which have not been sown later than the last week in March. We have always conceived it a great object to get the barley harvested during the month of July; and in moderately dry years this can always be done by sowing early; and, if not in July, certainly early in August. In addition to the advantageous circumstances under which the grain will in general ripen at these periods, a further benefit is derived by having the harvest-work divided, as early-sown barley will always be ready, except under few and peculiar circumstances, previous to the wheat. It will by this means be found in general to fall at the slack season, between the hay and wheat harvest. If clover and grass seeds are sown with the barley, a greater autumnal produce of the former will be obtained; or, if sown naked, it will permit a stubble crop of turnips or rape to be obtained, in the majority of years. The average meteorological circumstances of the district where barley is sown, ought always to be taken into consideration in deciding upon early or late sowing; and this average ought to be made on observations continued over a long series of years—not less than twenty, if possible—as some districts vary from others as to the period when the rainy and stormy weather occurs, that is usually attendant on the vernal and autumnal equinoxes and the summer solstice. This, in conjunction with the length of time which a crop takes to ripen on an average of seasons on particular soils in different districts, in a medium state of tillage, can only be arrived at by careful attention. The main things to be avoided are, on clay soils not to expose the crop to the chance of heavy rains in the spring, and not to sow it so late that it will continue green in autumn, as barley sown on stiff soils, at a late season in the spring, is very liable to continue green to a late period of the year, if the season proves dropping. The only objection to sowing barley very early on fine rich soils is, that it

* I have reaped barley in a forward season by the middle of July; and in some of the sheltered valleys in the mountainous districts of Caernarvonshire, it has been cut as early as the 10th of July.

may be pushed too forward before the hot weather sets in. On these points experience can be the only guide. It may, however, be stated, that when one acre of barley suffers in consequence of early sowing, five hundred suffer through being sown too late. This remark applies particularly to light sands and gravels not in very good heart. On such lands late sowing is particularly objectionable, for, if dry weather immediately follows the sowing, the crop will prove stunted, and scarcely worth gathering. If the season is cold, and the harvest unfavourable, the crop will have scarcely time to ripen, and when gathered will be worth little. As instances of the benefit of early sowing, we may mention what has occurred in our own practice. Fifteen acres of barley were sown after turnips on the last week of February; crop cut first week in July; and, as regards quantity and quality, equal to any in the neighbourhood. Seven acres in another year on poor gravelly soil, sown 17th March—spring cold and ungenial until the latter end of April; very favourable the first week in May, after which no rain fell for several weeks—crop reaped the 10th July; all the barley sown in the neighbourhood after the 27th April was a complete failure. Corresponding with the preceding remarks are the observations of the writer of the *Bedfordshire Survey*, 1808, who states:—

The barley seed-time on the clays begins as soon as the land has become sufficiently dry in the furrow, and which usually happens at the beginning of April. Much depends on the state of the weather, as, if wet falls immediately after sowing, on binding or *rosiny* land, or such as is inclined to run into a battery state, the shoots of the barley are unable to break the incrustation on the surface.

The time of sowing on light soils depends on the turnips being cleared off. It has varied from the middle of February to the end of May, but it usually occupies the whole of April. Early sowing is supposed advantageous to the crop, in allowing time for a gradual and regular growth; and there is little doubt *that early-sown crops would prove the most valuable* at harvest, in case the weather prove favourable at the first stages of their growth. The effects of rain and frost seem less injurious to barley on warm soils than on *such as are more retentive of wet.* A sandy field was sown with barley at Lidlington in February 1799, and soon after it was sown a fall of snow covered the ground for some weeks. It was predicted that the barley would be chilled and perished, but it produced a good crop, which was ripe as soon as the wheat, and carted from the field previous to the ever-memorable hailstorm of the 19th August 1800.

It appears, from other observations, that early sowing (as in March or the beginning of April) is advantageous on sandy soils, as the barley becomes established in the ground at a time when the weeds do not vegetate so freely as is the case in May. Add to this, there is much to apprehend on the part of the barley in a dry spring, while the golds and other weeds quickly gain an ascendency, to the ruin of the crop.

The golds here alluded to are a serious annoyance to the farmer in the Roothings of Essex. It is a parasitic plant, and difficult to destroy. Very early sowing, however, would not suit the Roothings, being stiff clays.

In Drew's *Norfolk Husbandry* it is stated that barley, if put soon into the ground, and if the weather prove favourable, casts better, and usually produces better crops than if sown late. Thus, upon

strong land, it is apt to run to straw when not sown in good time, and this occasioning it to lodge, discolours the grain: while, upon light land, there will be little straw and less corn, and both will be of very inferior quality. In contradistinction to this, Mr Burrough, who is an advocate for early sowing, under any circumstances whatever, states in his *Cultivation and Harvesting of White Crops*, that he gave directions to have his general crop of barley sown early in April, but deferred the sowing of two acres until the first week in May. The result of the experiment was as follows: The early sown crop looked very promising until early in May, when, after a few nights' frost, it changed its colour, many of the collateral shoots died away, and the crop produced but indifferently. On the contrary, that part of the field sown in May was not checked, but grew luxuriantly, and produced considerably more than the former to the acre. The field was a light loamy sand, with a subsoil of *cold yellow clay*.

"Upon a second experiment it was found that, notwithstanding the early sowing, *the crop was not injured by the frost*, yet it was not so productive as that which was sown three weeks later."* Our opinion is, that it was the cold yellow clay that injured the crop by its retention of moisture, and thus starved the plants in the early stage of their growth. With respect to the quantity of seed that should be used per acre, three bushels will be found sufficient under management with the drill, as previously described; broadcast, four bushels ought to be used, except on very rich friable soils, when three bushels will be found sufficient; on stiff soils, from three to four bushels should be employed, according to circumstances; on very light soils, early sown, three bushels and a-half should be used by the drill, and four bushels broadcast. However the dispute may terminate respecting the light and heavy seeding of wheat, there can be no doubt about the fact that full seeding is beneficial to the barley crop. It may be incidentally remarked that a very considerable benefit to the barley crop, arising from early sowing, is, that it in a great measure frees it from the ravages of the wireworm, or, at all events, causes that pest to be less destructive than it otherwise would be. Rolling, except on very light lands, is not so beneficial to barley as to other crops; otherwise rolling partially remedies the ill effects of the wireworm. Rolling generally causes grain to tiller out. As barley should be sown pretty thick and lay light, it follows that rolling is not generally so beneficial to the barley as to other grain crops. On stiff lands rolling, in the majority of cases, is prejudicial to barley.

* On this point Mr Towers observes, in the last volume of the *Journal of Agriculture*—"Here I would observe, upon the very important question of autumnal-sown Chevalier barley, that after the severe and long-protracted winter of 1846-47, the crops under my observation became superb in the spring, and at harvest-time greatly surpassed those of 1848, which had had no winter to contend with; a pretty fair proof that, on porous and well-drained barley soils, the rigour of frosts need not be feared."

Different varieties as suited to various situations.—Barley is divided by botanists into two distinct species, the two and six rowed; a four-rowed kind is sometimes made mention of, though no such kind is to be found. Of the two-rowed kind there are several sub-species, known amongst farmers as spring barley (*hordeum vulgare*;) the long-eared (*hordeum zeocriton*;) and the sprat or battledore (*hordeum distichon*;) winter (*hordeum hexastichon*,) called bere or bigg; rath-ripe, or naked barley, sometimes, but improperly, called Siberian barley. Recently a kind has appeared, called the Chevalier, with several other kinds, named either from the places of their growth, or from the persons who originally introduced them into notice.

The bere or bigg (six-rowed) may be sown as a winter or summer crop, and is sometimes sown in autumn, in order to produce a crop of green fodder in spring; for which purpose it is esteemed, by some persons, equal to a crop of tares, and on poor land as superior. It is also occasionally sown on foul land, late in spring, as a sort of waste crop, the produce probably being not more than three quarters per acre of poor grain, only used for feeding hogs; for which purpose it is well adapted, notwithstanding the poor yield here named. Bere has been known to produce, under favourable circumstances, 80 bushels, and in some instances 100 bushels per acre. This kind flourishes in clay and other stiff soils, and withstands the vicissitudes of climate and soil better than any other description of barley. Spring barley is the sort usually cultivated, of which the Chevalier is an improved variety; it suits all soils, and may with safety be sown early, for a crop after turnips. On land of moderate fertility and medium heart, this sort is as well adapted as any. The Chevalier on such soils produces a fair crop, and, if well harvested, of a quality much liked by the maltster. In an experiment made under the sanction of the East Lothian Agricultural Society, upon the common spring barley and the Chevalier, both sown on a light gravelly soil, the produce of each, per imperial acre, was:—

	Bush.	Pecks.					
Chevalier,	62	2	$56\frac{3}{4}$	lb. per bushel,	and of straw		4251 lb.
Common,	61	2	$54\frac{3}{4}$	...	and	...	3734 lb.

The seed was sown after a crop of turnips and mangold-wurzel, only one-third of which was eaten upon the ground.

The Chevalier is a general favourite with farmers on light soils, and such as are only of moderate fertility; but it is not equal to the one about to be noticed, when sown on soil rich either naturally or by artificial means. On such land no description of barley is comparable, as respects quantity and quality, with the long-eared variety. It may be sown early, and suffers less from climatic influences on stiff soils than any other sort, except bere. If sown on poor soils this species deteriorates in quality and yield very rapidly. This is

the kind of which the Belgians and Dutch obtain such large crops in their polders. Sprat or battledore barley is well suited for light warm soils, to be sown about the middle to the end of April. The grain is fine and clean-skinned, but the yield is not nearly equal to the Chevalier or long-eared varieties. It grows quick, and is suitable to lands liable to drought.

The rath-ripe is a very delicate variety,—the only kind we are acquainted with which is decidedly injured by frost. It can only be grown on dry warm land. Sudden changes of temperature affect this species very seriously: it is not, therefore, sown in general until the beginning or middle of May, and has been frequently put into the ground so late as from the 10th to the 20th June. It ripens so early, in warm summers, that it is frequently ready to be cut in nine or ten weeks from the time of sowing, and, on some of the very forward soils of our southern counties, has been known to be cut within a shorter period, in consequence of these qualities of late sowing and early ripening. Notwithstanding its delicacy and comparatively small produce, it is much cultivated in the southern part of the kingdom, to which it will always be confined, as it is not at all adapted for the moisture and cold of our northern, or even midland counties. A black barley is cultivated generally as a winter species, (six-rowed;) on good soils it is prolific but excessively exhausting. For rich soils the long ear, for moderately fertile soils the Chevalier, and for weaker soils the common barley, are respectively to be preferred. The ordinary yield of barley is from 32 to 48 bushels per acre of from 52 to 56 lb. per bushel. Bere only weighs from 40 to 45 lb. per bushel. It will not be out of place to allude here to the derivation of the botanical or Latin name of barley, viz., *Hordeum*, which appears to be derived from the Greek; for Pliny, quoting Menander, states that—

Barley (husked) was the most ancient meal in old time, as may appear by the ordinary custom of the Athenians, as also by the addition or surname given to sword-fencers, who upon their allowance or pension being given them in barley, were called Hordiarii (or barley-men.) "The ordinary dry groat or meal called '*Polenta*,' which the Greeks so highly commend, was made of nothing else but barley, and the preparing thereof was of sundry ways," which he gives, mentioning, amongst others, the mixing of linseed, caraway seed, and salt. He further says, "As for the bread of barley, so much used by our forefathers in old time, the posterity that lived after found to be naught, and condemned it; in such sort, as they allowed it for provender only to feed their beasts and cattle with. But instead thereof came up the use of husked barley to be sodden for gruel," &c. "Now ptisan, or husked barley, is best that which cometh from Utica. As for that which we have from Egypt, it is made of the flat barley which groweth upon the ear in two ranks or sides only." *Turrannius* saith, "that in the realms of Granada, Andalusia, (Spain) and Africa, the barley whereof the said ptisan is made is smooth and naked in the ear, without ribs or beard at all. "The manner" he says, "of preparing husked barley and making ptisan is well known, and I need not to say a word thereof." He makes some further curious disclosures respecting this grain, viz., "As for barley ears, some there be which have but two ranks or rows, others again have more, even to the number of six. In the very grain also there is much difference, for there be many of them longer than others, lighter, shorter, rounder, whiter, blacker, and, last of all, inclining to a reddish or purple colour. This is the worst of all others for dry groat or polenta; and as for the white, it is the best for this purpose, but will not

abide any tempestuous or hard weather. And to say a truth, of all corn barley is the softest and tenderest, and will least endure any hardness: it should not be sowed but in a dry and fine ground, laid light and brought into temper, howbeit, good it must be and well in heart.' Furthermore they say, that barley is sowed with the rake, viz., that the mould should lightly cover it; and therefore it cometh up soonest and bringeth most increase and plenty. That which is gathered in Carthage in Spain, within the month of April, is sown the very same month in Celtiberia, so as in one year it yieldeth two crops. It is no sooner ripe but they make greater haste to cut it down, and to gather it, than any other corn, for the straw is very brittle, and the husks which contain the grain is as thin and small." It further appears, from the same authority, that the Romans sowed barley in winter, as he states: "First there is the winter corn, which being sown about the setting of the star Virgillia, *i. e.* in November, lieth all winter long in the ground, and there is nourished, as, for example, wheat, rye, and barley." After other remarks it is stated, "but wheat, barley, beans, navews, turnips, and rapes, they hold for *Sementria, i. e.* to be sowed at the proper and timely season of seeds, that is in autumn."

The description of soil, and preparation of the same for the barley crop, as given by Pliny, holds good to the present day. Seeing, also, that barley amongst the Romans was esteemed a winter grain, at a period when Italian winters were occasionally more severe than they are at the present day—as we read of the Tiber and Po being frozen over—that barley was gathered in the month of April at Carthagena, and consequently must have been a winter crop—there can be little doubt that, if barley could withstand the winter of these places, it can surmount with ease the rigours of our springs: wet, not frost and snow, is the great enemy to the barley crop. In the preceding account of the culture of barley the *best mode* only has been described, which we particularly recommend; and it implies the use of the drill. The mode of culture can however be adopted in broad-cast sowing, without variation. It may be mentioned, that if barley is sown very early, that is the latter end of February and beginning of March, the drill should be set half an inch deeper than previously mentioned, that is, two and a half inches deep for early sowing.

THE FARMERS' NOTE-BOOK.—NO. XXVII.

Useful Insects and their Products. By JAMES H. FENNELL, Author of *A Natural History of Quadrupeds*, &c.—The female insects of the extensive genus *Coccus*, sometimes called *scale*-insects, yield materials for dyeing. Considered as an article of commerce and manufacture, and bearing in mind the small amount of capital and labour required in its production, we may fairly pronounce the cochineal insect of far greater importance to mankind than any other of the insect tribe; and certainly it has contributed more efficiently to enrich the posterity of the Spanish adventurers in America, than the wealthy mines of Peru and Mexico. Some years since, Humboldt stated that the quantity of cochineal annually exported from South America was worth above five hundred thousand pounds. Great Britain alone annually consumes about two

hundred and seventy-five thousand pounds' worth of cochineal. These facts ought to teach people the absurdity of despising any creatures on account of their minuteness. With the exception, perhaps, of indigo, the cochineal insect (*Coccus cacti*, Linn.) is the most valuable dye. The Spaniards, on arriving in Mexico, in 1518, found this crimson-scarlet dye employed by the natives, who were the only people who systematically attended to its culture. As early as 1530, Acosta stated it was an insect, and so subsequently did Herrera and Hernandez. Probably misled by its external appearance, the generality of Europeans insisted that cochineal was the seed of a plant, and, notwithstanding the conjectures of Lister, and the assertions of Père Plumier to the contrary, the popular error continued until Hartsoeker in 1694. Leuwenhoek and De La Hire in 1704, and Geoffroy, ten years later, incontrovertibly proved its real nature, by means of the microscope and dissection. In Mexico and Peru, where the greatest quantity of cochineal is nurtured, this insect feeds on the prickly-pear, or nopal-tree, which, according to some authors, is the *Cactus cochinilifera* of Linnæus; but Humboldt says it is unquestionably a distinct species of *Opuntia*, bearing fruit internally white. The Mexicans cultivate it chiefly in the independency of Oaxaca; and some plantations contain 50,000 or 60,000 nopal trees in rows, each being kept about four feet high, for easy access in gathering the insects. The cultivators prefer the most prickly varieties of the plant, as better protecting the cochineal from other insects, and to discourage these they carefully cut off the flower and fruit. But the greatest number of the insects are kept in small *nopaleries*, belonging to extremely poor men, called *nopaleros*. They plant their nopaleries on cleared ground on the slopes of mountains or ravines, two or three leagues from their villages; and, when duly cleaned, the plants will, in the third year, maintain the cochineal. The time of gathering is just before the laying of the eggs, when the insect's body has swelled to so great a size that the legs, antennæ, and proboscis are scarcely discernible by the unassisted eye. After the laying the female becomes a mere husk, and is then, in a commercial point of view, as valueless as the males. It appears, therefore, as if the unborn insects furnish the principal part of the colouring matter, and that only a sufficient number of the females are allowed to produce their brood to continue the race. In a good season they reckon that one pound of young insects, placed in the nopal-tree, produces, in three months, twelve pounds of mother cochineals, rich in colouring matter, together with sufficient progeny for next gathering. In April or May, branches or joints of the *Tuna di Castilla*, laden with *semilla*, (that is, the small recently-hatched cochineal insects,) are purchased in the market of Oaxaca, and are kept for twenty days inside the huts, and then exposed to the open air under a shed, where, owing to their succu-

lence, they continue to live for several months. In August and September, the then pregnant female insects are placed in nests made of a species of *Tillandsia*, (called *paxtle*,) and which are distributed upon the nopals. In about four months the first gathering, yielding twelve for one, takes place; and in the course of the year there are two more profitable harvests. This period of culture and gathering refers chiefly to the districts of Sola and Zimatlan. In colder climates the semilla are not placed upon the nopals until October, or even December, when it is necessary to shelter the young insects by covering the nopals with rush mats, and the harvests are proportionably later and unproductive. The nopaleros in the town of Oaxaca feed their insects in the plains from October to April; and at the beginning of the other months, during which it rains in the plains, they transfer them to their nopaleries on the neighbouring mountains, where the weather is finer. Great care is needed in the work of gathering the cochineal from the nopals. The cochineal insects are killed either by immersion in boiling water, by exposure to the sun, or by placing them in ovens (*temazealli*) used for vapour baths. The last method, which is least used, preserves the whitish powder, or *bloom*, on the red and shrivelled body of the cochineal; and, in that condition, being less liable to the adulterations often practised by the natives, it fetches a higher price both in America and Europe. From Mexico the living insect has been introduced to Cadiz, Rio de Janeiro, Malta, Corsica, and Java. In fact there does not appear to be any obstacle to its culture in any warm country, where the prickly pear, or nopal (*Cactus opuntia*) can be grown. A few years ago some Mexican cochineal insects sent to Old Spain were thriving very well on the prickly pear of that country; indeed, they were said to rival even those of Mexico in the quality and brilliancy of their dye. About six or eight species of cochineal have been introduced from China into India, where the insect was first introduced at Madras some fifty or sixty years since. At first the East India Company could only succeed in procuring from Brazil the very inferior wild cochineal (*Coccus sylvestre*). The introduction and culture of cochineal in Europe has also been attempted. About the year 1833, Count Nicholas Roumianzoff gave a thousand rubles to insure the introduction of the insect at the imperial garden of Nikita, on the southern coast of the Crimea, where the tree on which it feeds is found to thrive. Its naturalisation may doubtless be extended along the shores of the Mediterranean, Sicily, and the different states of Greece—the prickly pear being indigenous in those places, and by little cultivation will afford sufficient nourishment for the insects. Dr Gorman, acting on behalf of the Government, introduced these insects on the island of Malta, where they were likely to do well. M. Chevreul found that the colouring matter of some cochineal, obtained in 1845 from the central nursery grounds

of Algiers, is less powerful than that of the Mexican cochineal; but he is of opinion that the colonial specimens may by proper culture be greatly improved. The attempt has been made to naturalise cochineal insects in the Jardin des Plantes, at Paris; and one of the objects of the establishment of the gardens at St Vincent's was to rear them in that island. Mr Sells thinks the real cochineal might be introduced into England, as specimens of it have been reared on the *Cactus* at Claremont, Surrey. Some years ago Dr Gorman discovered the wild species of cochineal (*Grona sylvestris*) living among the leaves of the coffee-plants, acacia, &c., in the Cambridge Botanic Garden, where the gardeners called it the "amelca bug." It is the kermes or gronilla of Spain, about which so much has been said in endeavouring to identify it with the *Grona fina*. At all events, it is the same species as the gronilla found on the green oaks in Andalusia, where in some years large and valuable crops are gathered by the Spanish peasantry, and sold to the Moors. As, at Cambridge, it is found that these insects are so prolific that the young ones often distribute themselves over the neighbouring plants, it would be worth while to attempt the cultivation of the prickly pear in the open air of England, placing the insects upon them, for, in all probability, these creatures would, by good management, do well.

Brazil produces both the insect and its peculiar plant; but the Brazilian cochineal is wild or uncultivated, and very inferior to the Mexican. Spix says that it is found in many parts of the province of St Paulo, particularly in sunny meadows, and might become a profitable article of culture if the Brazilians were not so averse to labour while they can gather other rich gifts of nature without trouble. There is a wild species of cochineal, which feeds on most of the species of *Cacti* found in Mexico, requires no particular attention, and is gathered six times in the year; but the cultivated cochineal, the slow and progressive improvement on the wild breed, is found only in the gardens and plantations, where it attains nearly double its original size, feeds only on one species of *Cactus*, the nopal, and produces only three times in the year. Wild cochineal is also found plentifully in Tucuman and other places, but considerably inferior to that of Mexico.

Mr Walton mentions a green dye, called by the Spaniards *clavillo*, (small nail,) abounding in the valley of Catamarca, Tucuman, Carquejia, and many parts of Upper Peru. "Some assert that it is the excrement of a small insect, and others that it is the insect itself. It is found introduced, as with a point, into the outside bark of a shrub; and after Alpaca and Vicuna wools, or cottons, have been boiled in a solution of yellow dye, and then cast into one of *clavillo*, they acquire a beautiful green colour."*

* Walton's *Treatise on Peruvian Sheep*, 1811, p. 180.

The Rio cochineal seems to be different from Linnæus's *Coccus cacti*, which is described as being flat on the back, with black legs and tapering antennæ, whereas the Rio insect is convex, with six clear bright legs, and moniliform or bead-like antennæ. The male's body is of a bright red; the breast elliptical and slightly attached to the head; the antennæ about half as long as the body; two wings, erect, of a faint straw colour; and two white filaments, thrice as long as the insect, projecting from the abdomen. The female is wingless, of an elliptical form, convex on both sides; her abdomen is marked with transverse furrows; her back covered with a fine downy cotton-like substance. This insect feeds upon the juices of the *Cactus opuntia*, called at Rio *orumbela*, which it punctures with its brownish beak. When about twenty days' old the female becomes pregnant, and dies after bringing forth an innumerable offspring. These are so minute as to be easily mistaken for eggs, particularly as they remain without the least appearance of life, for about the space of a day. In three or four days they begin to increase rapidly in size till equal to a grain of rice. When arrived at full growth they cease to move, and become attached to the leaf in a torpid state. This is the proper period for gathering them. To convert them into cochineal, the live insects are put into a flat earthen dish placed over a charcoal fire, and par-roasted very slowly, till the down upon them disappears, and their aqueous juice entirely evaporates. During this simple process they are constantly stirred about, to prevent absolute torrefaction, which would reduce the insect to ashes, and so destroy the colour.

About seventeen years ago a species of cochineal, which yields a red colour, was discovered upon oaks in the interior of New Holland.

The habits of the cochineal insect of Madeira, which belongs to a different genus (*Pseudo-coccus*, Westwood,) are unlike those of the ordinary kinds—as the females bring forth living young, which are not deposited beneath the body, but which creep up the plant as soon as born. Moreover, the male pupæ are enclosed in a bag-like cocoon, open at the lower end, ont of which the perfect insect creeps backwards with its wings thrown over its head.

A species of *Coccus* found on the roots of the salad burnet, (*Poterium sanguisorba*,) was used by the Moors for dyeing silk and wool of a rose colour, but is now neglected; as also is another sort, called *Coccus uva-ursi*, (from its being found on the red bear-berry,) which insects afford with alum a crimson dye. The Armenian cochineal, found on the roots of the *Æluropus lævis*, a common plant in the steppes of Eriwan, was an article of commerce before the Mexican was known. Messrs Hamel and Brandt refer it to a separate genus, calling it *Porphyrophyra Hamelii*. M. Hamel endeavours to prove that the red colour so

often spoken of in the Bible, and by ancient writers, was produced by the Armenian cochineal, which, about fifteen years ago, was discovered to exist in the marshy spots in the valley of Araxa, feeding on the root of the *Poa pungens*, and differing from the Mexican cochineal by the greater number of joints in the antennæ, by its shorter fore-feet, and by having numerous bristles on the hinder parts, while the American species has but two. The Armenian cochineal has more colouring matter than the Polish cochineal, and one pound of it contains from 18,000 to 23,000 insects; the Mexican, from 20,000 to 25,000; and the Polish from 100,000 to 150,000.

The Polish or German cochineal, (*Coccus polonicus*, Lin. *C. radicum*,) is found on the roots of the perennial knawel, (*Scleranthus perennis*, Linn.,) and was formerly plentifully collected for dyeing red in the Ukraine, Lithuania, &c.; but though still employed by the Turks and Armenians to dye silk, wool, and hair, and to stain the nails of ladies' fingers, it is now rarely used by any Europeans, except by the Polish peasants.

Our dyers and colour-makers purchase cochineal of the merchants, for the purpose of producing a brilliant crimson-scarlet colouring substance. The colour is extracted from the dried insects either by water or alcohol; the solution or decoction produced having a very rich colour, and being capable of combination with other substances in a great variety of ways. The beautiful pigment called carmine, used principally in miniature and water-colour painting, and sometimes as rouge to give a fictitious bloom to pale faces, is a preparation of cochineal; it is a light, soft, velvety powder, of a most rich and magnificent scarlet, inclining a little to crimson. It is produced in various ways, each manufacturer deeming his own the best; but it is understood to be the result of boiling the cochineal in pure water for a certain time, adding alum and one or two other substances, evaporating the solution, and preserving the sediment in the form of carmine. After the finest quality has been thus produced, a repetition of the process produces a second quality; and even after this there is sufficient colouring matter to assist in the preparation of the water-colour pigment called *lake*, which is a term applied to a mixture of alum, or of some metallic oxide, with a solution of a vegetable or animal colouring substance.

The natural colour of cochineal is crimson, and, until a peculiar mode of combining it with another substance was discovered, the colour at present called scarlet was hardly known. Keffler, a German chemist, is said to have discovered accidentally, about two centuries ago, that a solution of tin would exalt the crimson colour of cochineal into a scarlet. He brought his secret to London; and the first establishment for dyeing scarlet in this country appears to have been at the village of Bow, Middlesex,

whence it obtained, for a long time, the name of the *Bow-dye.* About the year 1667, a Fleming named Brewe, invited over by Charles II., with the promise of a large salary, is said to have brought the art of scarlet-dyeing to great perfection. At Mr Monteith's celebrated manufactory in Scotland, the dyeing of scarlet cottons was brought to such perfection—excelling in colour everything before produced—that his bandannas were exported to all parts of the globe.

A remarkable instance of the divisibility of matter is seen in the dyeing of silk with cochineal, where a pound of silk—containing eight score threads to the ounce, each thread 72 yards long, and the whole reaching about 104 miles—when dyed scarlet, does not receive above a drachm additional weight; so that a drachm of the colouring matter of the cochineal is actually extended through more than a hundred miles in length; and yet this minute quantity is sufficient to give an intense colour to the silk with which it is combined.

Before cochineal was used, kermes (*Coccus ilicis*, *C. Kermes*) was the general dye for producing the brightest red, or crimson dye, then known, and it is still generally employed in a great portion of India and Persia, though the American cochineal has (in some respects undeservedly) supplanted it in Europe, where it is now little attended to, except by the peasants of its native provinces. The kermes insects abound on a small species of evergreen oak (*Quercus coccifera*, Linn., *Q. Ilex*) common in the Levant, Spain, the south of France, and many other southern countries. From the earliest ages, the crimson kermes dye has been used for colouring cloth, and it was known to the Phœnicians before Moses' time, by the name of Tola or Thola, and to the Greeks under that of *Coccus*, (whence the Romans derived their name for it, *coccineus*, the Spaniards their *coccinella*, and the English their *cochineal*,) and to the Arabs and Persians by the names of *kermez* and *alkermez*, (whence the French derived the name of the colour *cramoisie*, and we our *crimson*.) From the Latin epithets, *vermiculum* and *vermiculatum*, given to it in the middle ages, when it was thought to originate from a worm, have been derived the French *vermeil* and the English *vermilion*, though now applied to pulverised cinnabar.

Lac, an article of frequent use in the arts, is a compound substance—sometimes called a *gum*, but erroneously, for it is neither a gum nor a resin—prepared by the females of a minute insect, indifferently termed the *Coccus ficus*, *C. lacca*, and *Chermes lacca*. These insects exist in most of the forests of the Indian islands, but particularly in those of Sumatra and the Malayan peninsula. Its produce is, however, inferior to that of Bengal, and especially of Pegu, which countries chiefly supply the large consumption among Chinese, while the lac of the Indian islands is chiefly confined

to home consumption. Milburne assures us that it is so abundantly produced on both sides of the Ganges, that were its consumption ten times greater than it is, the markets might be supplied.

In and near the East Indies, the lac insects are nourished on several species of trees, affixing themselves to the succulent extremities of the young branches. Around their edges they are environed by a tenacious semi-pellucid liquid, which seems to glue them to the branch; and it is the gradual accumulation of this liquid, forming a complete cell for each insect, which produces the substance called *gum-lac*. When the cells are formed, the insect has the appearance of an oval, smooth, red bag, without life, about the size of a small cochineal insect, and full of beautiful red liquid. When the eggs are hatched within the cell, the young insects, after feeding upon and consuming this red liquid, pierce a hole through the cell, and issue forth to open day one by one, leaving a white membraneous substance in the cell. Thus the lac seems to furnish a kind of nest or dwelling for the insects in their earliest state. Dr Roxburgh having placed some small branches of the *Mimosa cinerea* in a wide-mouthed bottle, on which were some pieces of fresh-looking lac, he carefully watched the progress of the insects. On the third day small winged insects were seen to issue from the lac, evidently forcing for themselves a passage with some struggling. At the end of fourteen days he observed myriads of exceedingly minute animals creeping about the lac, and more still issuing from small holes over the surface of the cell. The insects, when single, ran about pretty briskly, but in general they are so numerous as to be crowded over one another. On opening the cells, he found that the substance of which they were formed bore much resemblance to amber; the external covering was remarkably strong and resisting, but the partitions between the cells were thinner. The cells were in general irregular squares, pentagons, and hexagons, about an eight of an inch in diameter, and a quarter deep; and no communication existed from one to another. The cells, which were opened during the issue of the minute insects, seemed to be occupied in two different ways. One half of each cell contained a small bag filled with a thick red jelly-like liquor, replete with what Dr Roxburgh considered to be eggs: the bag adhered to the bottom of the cell, and had two necks, which passed through perforations in the external coat of the cell. The other half of each cell had a distinct opening, and contained a white substance like a few filaments of cotton rolled together, and also numbers of the insects themselves ready to make their exit. On the following day, the insects continued issuing from their cells in great numbers, of a deepened red colour, and more lively in their movements than those before observed.

Thus the lac, of which the cells are formed, seems to be a residue which, after serving as a nest for the young, is left as valuel by

the insects. In a commercial point of view, there are four sorts of lac; but all are derived from these cells. In the first place, there is the *stick-lac*, which is the lac in its natural state, obtained in pretty considerable lumps, with much of the woody parts of the branches on which it is formed adhering to it; secondly, the *seed-lac* is a collection of granules, obtained from the former after the colouring matter has been extracted by water; *lump-lac* is the seed-lac after it has been purified by fire, and formed into cakes; lastly, *shell-lac* is the purified lac, or the cells liquified, strained, and formed into transparent laminæ. *Stick-lac* is collected in Eastern countries twice a-year; and the only trouble in procuring it is in breaking down the leaves and branches, and carrying them to market. When the twigs or sticks are large, or only partially covered, the lac is frequently separated from them, to lessen the expense of freight to Europe. *Shell-lac* is produced by breaking this crude material into small pieces, picked from the branches and sticks, and put into a sort of canvass bag or tube, about four feet long and six inches in circumference. Two of these bags are in constant use, and each of them is held by two men. The bag is placed over a fire, and frequently turned, till the lac is liquid enough to pass through its pores, when it is taken off the fire, and squeezed by two men in different directions, dragging it along the convex part of a plantain-tree prepared for the purpose. While this is doing, the other bag is being heated, to be treated in the same manner. The dragging of the bags over the surface of the plantain-tree has the effect of depositing a layer of the melted lac upon it; and the thickness of this layer depends on the degree of pressure exerted on the bag. The fineness of the resulting shell-lac depends on the fineness or porosity of the bag through which it is strained.

The Indians employ lac in a great variety of ways, as a material for ornaments, as a varnish, and as a dye. They use the lump-lac in making *bangles*, or ornaments in the form of rings, for the arms of the lower class of females—the best shell-lac being used in manufacturing these ornaments for the superior classes; as also beads, spiral and linked chains for necklaces, and other ornaments. As a varnish, the lac is used in a curious manner; it is first formed by melting small pieces together into sticks, something like our sealing-wax, which are covered with cinnabar or any other pigment. The box, cabinet, or piece of wood which is to be varnished, is heated by means of a charcoal fire, and then rubbed over with a stick of lac; the smooth regularity of the lac being insured by rubbing it over with a piece of folded plantain-leaf. Ornamental figures are frequently formed of coloured lac drawn over the heated surface of the article to be ornamented. In ornamenting their images and religious houses, the Hindoos frequently make use of v[illegible]y thin beaten lead, which they colour with various varnishes [illegible]le of coloured lac; the leaf of lead is laid upon a smooth iron

heated from below, while the varnish is being spread on it. Lac is sometimes curiously applied in the making of the polishing grindstones used by the Eastern lapidaries. The natives mix three parts of river sand with one of seed-lac in a vessel over a fire, and form the mass into the shape of a grindstone. A square hole being made in the centre of the grindstone, it is fixed on an axis; and by warming the surface of the lac, the grindstone may be brought to a right form. The grindstones vary in the proportion and quality of the sand mixed with the lac, according as they are to be employed for cutting or for polishing. It will be evident that the lac here plays no other part than that of a cement whereby the particles of sand are combined into a solid substance.

When water is poured on powdered stick-lac, the liquid immediately begins to be tinged with red, and the addition of heat produces a deep-coloured crimson solution. This colouring substance, the source of much of the value which attaches to lac, enables it to be used both as a coloured pigment and as a dye by the natives of India. The colouring matter, which is extracted in various ways, is formed for sale into small square cakes or pieces, like those of indigo, which obtain the name of lac-dye, lac-cake, or cake-lake. These cakes, when broken, appear dark-coloured, shining, smooth, and compact, and when scraped or powdered, present a bright red colour, approaching to that of carmine. The seed-lac and the lump-lac are less used as a colouring than as a kind of varnish, for they consist principally of the resinous portions left after the colouring matter has been obtained. The Indians, to dye with the lac-dye, take one gallon of the red liquid, and add to it three ounces of alum; three or four ounces of tamarinds are boiled in a gallon of water, and strained; equal parts of the red liquid and of the tamarind-water are then mixed over a brisk fire; and the pieces of silk or cotton-cloth to be dyed, are dipped and wrung alternately, until they have received a proper quantity of the dye. To increase the colour, they increase the proportion of the red liquid, and prolong the time during which the cloth remains immersed in it. To render the colour binding in the silk, they boil a handful of the bark called "load" in a little water, and dip the silk in the decoction several times. An ink, not easily acted upon by moisture, is made by adding a little borax, lamp-black, or ivory-black to a solution of lac. It is partly as a dye, and partly as a varnish, that lac comes to this country. As a dye, the colour given by lac is less beautiful but more durable than that given by cochineal. Some persons have recommended its adoption as a vehicle for colours in painting, for which it appears to have certain favourable qualities. As a varnish it is used in the manufacture of some kinds of liquid varnish, in the manufacture of the best sealing-wax, and, within the last few years, in the hat manufacture.

The Real Agency of the Pure Earths. By J. TOWERS, Member of the Royal Agricultural Society of England.—This subject, which is of vital importance to agriculture, was suggested to me in perusing an article that appeared, originally, I believe, in the *Phytologist*, and an extract from which will speedily be laid before the reader. I must, however, introduce it by some remarks upon the earths which constitute the staple of all arable lands; and I greatly regret my inability to do little more than suggest. Chemical knowledge, as referred to rural affairs, is still in a state of infancy; and, as exerted by the most able authorities of the day, is perplexed with contradictory hypotheses. Let any one examine the Essay on Experimental Agriculture, which occupied pp. 83–108 of the October number for 1849 of this Journal, by that eminent, and patient investigator, Professor Johnston, and he will scarcely fail to arrive at the conclusion that every chemical agent, in common with "each of the salts of ammonia, and each of the nitrates, *exercises a special and peculiar action upon vegetation*"—that the action of such substances "is probably different in the case of different plants, and is modified also by *climate, season, soil, locality, and other circumstances.* That to make out the several special actions of these compounds, and the modifying influence of circumstances, will require many carefully-conducted and skilfully-contrived experiments."

The *pure earths*, so called, must be carefully distinguished from soils as prepared by the art and labour of man for the purposes of cultivation. By the term *earth* we refer solely to those native substances that constitute the basis of arable land, and which are in themselves little, if at all, soluble in water—namely, 1st, flint, silica, or sand; 2d, alumina, or clay; 3d, chalk, or carbonate of lime; and 4th, the peroxide, generally intermixed with the sub-oxide, of iron. Without all these basal substances, combined, however, in exceedingly variable proportions, no genuine loam can exist. It is true that, by the experiments of the late Sir Humphry Davy, and of other analytic chemists, the three first-named substances have been determined to be metals, combined with equivalent portions of oxygen; yet, as their metallic bases are never found in the land, the original expression of native earths is distinctively retained.

1st, *Silex.* I borrow the following description as being apposite to the object I have in view. This earth of flints consists of crystals of hard stone, constituting gravel or sand, according to their size. The finest siliceous sand, under the microscope, appears as irregular fragments of stone, detached, and void of any principle of cohesion. It holds water in its interstices, in proportion to its fineness, but lets it pass away by filtration or evaporation so rapidly, that no vegetation can progress or be sustained, unless a constant supply of moisture be maintained by watering.

2d, *Clay* or *alumina* is never found pure, even in the stiffest

ground; but it may be obtained from a watery solution of alum by the addition of soda or potash (salt of tartar) dissolved in water, which precipitates a white and rather curdy mass of the earth of alum. This earth is the base, or pure matter of clay, and confers tenacity on those compounds of silex, alumina, chalk, and oxide of iron, that, in agriculture and brickmaking, bear the name of clay. Alumina, according to *The Book of the Farm*, exists in clays to the extent only of 30 or 40 per cent, whereas the quantity of silica in such soils amounts to from 60 to 95 per cent. Alumina exerts no direct chemical influence on vegetation, and is scarcely ever found in the ashes of plants.

3d, *Chalk* (*carbonate of lime*) is abundant throughout nature. In good loams its quantity varies considerably—from almost nothing to 12 or 15 per cent. It is insoluble in water, unless, as was shown in a late article, it be held in solution by a double quantity of carbonic acid, as is the case in hard waters.

4th, *Oxide of iron*. This is the colouring principle of soils. It confers on them every variety of tint, from a pale stone colour, and, through the many shades of buff and brown, to the full, deep red that is seen in some few localities. Iron, if in the state of a peroxide, is insoluble and harmless, and therefore may rank among the four earths which we regard as staples. They are all negative in their qualities as to chemical action, and perform no direct office in the phenomena of vegetable progress, other than that of fixing and retaining the roots while presenting to their absorbent organs the solutions which are prepared for their nutriment in the form of raw sap, and yielding free access to their further development in search of food. Having thus generalised, I shall, without further preliminaries, introduce the article to which I first alluded, and thus permit the writer to speak for himself:—

Although so much has been written on the subject of gases being evolved and absorbed by plants, and the obvious numerical preponderance of the stomata (breathing pores) in the leaves and branches over those in their roots, yet the broad assertion that *the office of the earths, in relation to plants, is precisely equivalent to its office in relation to animals*—namely, *to maintain them in the position best suited to their well-being*, has, I believe, never yet been made public in print. Almost as long ago as I can recollect, this phytological fact was impressed forcibly on my mind, by seeing how beautifully hyacinths blossom with their roots immersed in water, and without a particle of earth that they could possibly reach. I have constantly asserted my belief on this point, but have always been laughed at as a visionary and theorist. It is, however, with infinite satisfaction that I see my views daily gaining ground. Each succeeding year diminishes the number of those who assert that plants feed on earth as we feed on meat, bread, and potatoes. Still, by far the greater number of conversing mankind religiously believe this, and most farmers look on a rich soil as being directly food for their wheat, as a sack of barley-meal is food for their pigs. Now, the truth is the very converse of this; the *earth feeds on plants*—is increased by plants—owes what is called its richness and good properties to plants! The facts are not only interesting in themselves, but the ends to which they are applicable would furnish almost a new era in existence. It can scarcely be doubted that nature has provided in the earth the best possible receptacle for the roots of plants; yet even this position will admit of considerable modification,—for we have first to consider whether our object in cultivation is to carry out the designs of nature, or to

make nature subservient to our artificial requirings: if the latter, it is quite certain that art can be advantageously employed, for we have only to call to mind our common fruits and vegetables as examples. Thus, although plants may best achieve their destined ends when rooted in the earth, it may be reasonably doubted whether, in turning their good properties to our uses, a more advantageous receptacle may not be found. But without extending the inquiry so far as that, if it be once admitted that *earth is in nowise the food of plants*, then, *cæteris paribus*, the most unproductive sand —for instance, the heaths of Surrey—may be rendered equally productive as the golden valley: we have only to make use of this sand as nature directs—that is, *as a receptacle of roots*—and then, having learned *what is the true food of each plant, to supply that food* in a way the most profitable. It is now generally admitted that carbonic acid gas is their true food; but leaving even this question to those more competent to decide on it correctly, it is certain that their food, whatever it may be, *is evolved from certain chemical preparations*, rather than from the richest and most highly manured earth. Poverty of soil thus becomes a nonentity; rotation of crops a mere amusement; for, once admit that *earth is simply a receptacle of roots*, and you invest it with a property that you cannot wear out. Every common and heath may be made to produce wheat at the will of the cultivator, and the supply must, ere long, greatly exceed the consumption, since that very description of food, which causes so much difficulty to legislators, would become more abundant than the most zealous philanthropist could desire.

So far the article which met my eye in a secondary channel as a detached piece; but it there was ascribed to Mr Newman, author of a work on British ferns. It is, to say the least, argumentative, though bold and startling; and as such I venture to deal freely with it. We may fairly cede the point that the above four earths, with metallic bases, cannot furnish nutriment to plants, being insoluble unless they meet with some free acid, which might by mere possibility act upon the chalk and sub-oxide of iron; and consequently, that these earths, by moulding and giving texture to the land, prepare it to receive the roots, and act as a matrix and medium of support. But there are other circumstances which claim attention before it will be possible to decide how far the nutrition and growth of plants are dependent upon the earthy medium which fixes the roots, and enables them to permeate in all directions, according to their individual capacities.

There are various modifications of earth to which the appellation of *virgin soils* has been assigned: two of these, having been analysed by Professor Johnston, may safely be offered as genuine examples. The first, or No. 1., may rank among the barren earths, although not destitute of organic matter. In 1000 parts there were found of—

Organic matter, (as fibres or decayed leaves,)	40
Silica, or sandy matter,	778
Alumina,	91
Lime as carbonate,	4
Magnesia,	1
Oxide of iron,	81
	995

Such a soil might, and would, sustain some vegetation in garden and field, and be precisely applicable to certain wild plants—as, for instance, the purple sandwort (*Arenaria rubra;*) but, being deficient

in saline constituents, could not bring to perfection the nobler plants of the farm.

No. 2 yielded to the analyses, of 1000 parts—

Silica,	648	earthy constituents.
Alumina,	57	
Lime,	59	
Magnesia,	8	
Oxide of iron,	61	
Oxide of manganese,	1	
Potassa,	2	alkaline bases.
Soda,	4	
Chlorine	2	acids.
Sulphuric acid,	2	
Phosphoric acid,	4	
Carbonic acid,	40	
Organic matter,	17	resolvable into hydro-nitrogenous gases.
	985	
Loss unexplained,	15	

The reader should be aware that the severe analyses of the laboratory tear and rend to pieces, and thus discover the *ultimate products* of matters subjected to their agency. Those products above tabulated do not exist as such, (if we except the true staple earths,) but in a state of chemical union according to the combining law of equivalents. Thus, the 59 parts of lime would not be found in its caustic state, but as a mild carbonate, (chalk,) the 40 parts of carbonic acid uniting with about 50 parts of the lime, as their saturating equivalent; while the remaining 9 parts might, without any unwarrantable violence, be assigned to the phosphoric acid to form *bone* earth, or *phosphate*, and to the sulphuric acid, the product of which would be gypsum, or plaster of Paris.

The 15 parts lost would somewhat puzzle the young inquiring chemists; but as losses are inevitable, and as, moreover, the other elements before us are not greatly incompatible, data are furnished from which a shrewd conjecture may be formed of the real constituents of the 1000 parts before they were disturbed by chemical agency.

I have met with some remarks upon the constituents of the two soils alluded to, and which may be brought to bear upon the inquiry now pending. It has been conjectured that the average quantity of *nitrogen* in the soil of England, taken as a whole, scarcely exceeds a quarter per cent.

On the supposition that the component parts of the organic matter found in the above two samples were alike, it is clear that both in nitrogenous and calorific powers the virgin soil, No. 2, exceeds the barren, No. 1, nearly as 2¼ to 1. And in respect to soluble saline matter the difference is still more remarkable; for of many plants which might be enumerated, and which can grow in the soil No. 2, not one of them could procure the means of subsistence from the barren No. 1, deficient as it is of the alkalies, chlorine, sulphuric, and phosphoric acids—all of which, together with the oxide of manganese, and an increased amount of organic matter, are required to place it on a level with its competitor. To supply this deficiency is the business of the scientific agriculturist." The same writer, *Agricultor*, (who he is I am not

aware,) thus lends his aid to the theory of Mr Newman—"Experience has taught us that plants will grow in sand, in sulphur, or any other insoluble and inert substances, provided the necessary fertilising materials are supplied; from which it follows that the composition of the *absolutely insoluble portions* of a soil are of little consequence, provided the *calorific* (heat-imparting) and soluble constituents be present."

Having now adduced evidence in favour of the theory of the negative character and offices *of the earths*, (properly so called,) it only remains for me to collate the facts that bear upon the science and practice of agriculture.

It appears certain, that the principal knowledge that we can arrive at, concerning the requirements of plants as their appropriate nutriment, must be obtained by a strict analysis of their juices while alive, during the several stages of their growth. This I took the liberty to suggest to Professor Johnston, who, in reply, of date 10th Sept. 1847, assured me that his assistants were then occupied with an analysis of the turnip, seed-tops and bulbs, at various periods; that he had given instructions that the soluble matters in the leaves and bulbs should be examined separately; and that the same should be done with carrots, and, if not too late, with potato-tops and tubers—adding, "this will no doubt lead to some further light in physiology, for our knowledge of the inorganic matter of plants and its functions is as yet only in its infancy: *we must have investigations of a much more refined character than any yet made*, to help us forward in a right direction."

This is the truth; and we shall never understand the philosophy of culture and tillage, till we know what each individual plant really demands for its nutrition—what it absorbs from the ground, and *what it inhales* through the porous system of its foliage. The task is herculean—for labour, assiduity, and chemical acumen, must be exerted, perhaps for ages, ere we may be able to *know* the subjects *of* and *with* which we treat. As the case stands, Mr Newman and his advocates are, I conjecture, right in assuming that the staple insoluble earths afford no nutriment, and act only as *supporting* media, but yet qualified to conduct the products of electric agencies, which are ever at work, between the vital principle of the plants and the decomposable substances combined with the earths. This word, *combined*, leads to the consideration of manures; and here, till silenced by fact, I must insist upon the introduction of farm and fold yard products, of deodorised excreta, of carbonised peat—in a word, of all and every species of ordure which a law of nature requires us to bury within the earth. It is not that plants can devour or feed upon such putrescent matters, for not a particle of solid, or even of dissolved *colouring* matter could pass into the absorbents of the root; but because such decomposable remains develop heat, gases, and an *electric current*, which passes through the moist terrene medium, and conveys to the rootlets the infinitely fine particles of gaseous matter that are

resolvable into food. Liebig maintained that humus in the ground produced an atmosphere of carbonic acid, which, in adequate quantities, is taken up by the leaves according to their capacity. It may be so; and it may be, and also most probably *is*, the office of soils to present to the roots those hydro-carbonous, phosphoric, saline, and nitrogenous solutions which nature has qualified them to absorb. The question is an open one. At present our knowledge is little better than conjecture, but we are upon the road of inquiry. I close this paper with a few lines upon the subject of *humus*, copied from the *Penny Encyclopædia*, which, to say the least, are interesting and well-written.

This substance, (humus) has been called *vegetable mould*; after Thaër, and other eminent writers, we adopt the name of Humus. This is a dark, unctuous, friable substance, nearly uniform in its appearance. It is a compound of oxygen, hydrogen, carbon, and nitrogen, which is found only in some substances, as the elements of all animal and vegetable substances. It is the result of the slow decomposition of organic matter in the earth, and is found in the greatest abundance in rich garden mould, or old neglected dunghills. It is the product of organic power, such as cannot be compounded *chemically*. It also contains other substances in smaller quantities, as *phosphoric* and sulphuric acids combined with some base, and also earths and salts. Hnmus is the product of living matter and the source of it: it affords food to organisation,—without it nothing material can have life.

If such be, *de facto*, the comprehensive character of humus, we need not be surprised at the operation of manure in the soil; and hence we may be assured that pure earth unaided by the presence of decomposable substances, applied by art, cannot for any length of time remain fertile, so as to sustain a rotation of crops.

Geological Landscape Gardening.—By Mr DAVID GORRIE, Annat Cottage, Perthshire.—Long before the term geology was used to designate that science which teaches the "doctrine of the earth," and long before the art of ornamenting portions of the earth's surface was termed landscape-gardening, the natural conformation of each country, in which gardening as an art of taste was practised, had a necessary influence on whatever particular national style of adornment was adopted. Ancient history records one instance of a contrary kind; but this like other exceptions, serves to illustrate a general truth. The Median Queen of Nebuchadnezzar, says Mason, in his *Essay on Design*, "could never be reconciled to the flat and naked appearance of the province of Babylon, but frequently regretted each rising hill and scattered forest she had formerly delighted in, with all the charms they had presented to her youthful imagination. The king, who thought nothing impossible for his power to execute, nothing to be unattempted for the gratification of his beloved consort, determined to raise woods and terraces even within the precincts of the city, equal to those by which her native country was diversified." In this he succeeded, perhaps, in as far as it was possible for man to succeed; and yet the elevated gardens of Babylon, surpassingly

magnificent as they were, must have tended to show the littleness as well as the greatness of man. Babylon itself, built by its mighty monarch, as he said himself, for the house of the kingdom, by the might of his power, and for the honour of his majesty, formed after all but a speck on the wide plains of the East; and the gardens of Semiramis, unrivalled of their kind, could, after all, neither add to nor detract from the general features of the country. They manifested the power of art, but were overwhelmed with the vastness of nature. In a rocky country, their terraces would have been less conspicuous, but more appropriate. They harmonised not with the surrounding scenery of nature, and yet were too insignificant to form an effective contrast therewith. They were simply fitted to illustrate Dr Young's well-known and oft quoted lines,

> How poor, how rich, how abject, how august,
> How complicate, how wonderful, is man !

Incongruous, inharmonious, out of place, these splendid gardens showed how little man can do, even when he attempts to do great things; and also, how wise it is in the landscape gardener to adapt his style to the natural features of the place which he is endeavouring to adorn, rather than attempt to exalt his art by placing it in direct opposition to what has previously been done by a more powerful hand than his.

The valley of the Nile owes the maintenance of its fertility to natural, assisted by artificial, irrigation; and, according to Herodotus, the sacred groves or gardens of ancient Egypt were watered by meandering streams, which flowed from numerous fountains. Water was as essential to the Egyptian landscape as were the pyramid and the palm-tree. The gardens of Solomon were diversified with water; but being in a hilly country, that water was retained in artificial pools, or made its escape in rapid flowing rivulets, unlike that which moved gently along in the canals supplied by the Nile. Trees, moreover, were planted in a more picturesque style in Palestine than in Egypt. Persia employed the geometrical style, but it verged on the picturesque where the gardens or groves were extensive, and where irregularity of ground prevailed. Greece borrowed the Persian style, but altered it so as to make it her own. The farther that the Roman villas were removed from the city, and the nearer they approached the neighbouring hills, their style of gardening became more and more natural and picturesque. Art, indeed, prevailed greatly in them all; but the taste of the Romans for a display of architectural objects in garden scenery has been ascribed to their love of grandeur and magnificence. In more modern times, the steps, terraces, vases, and statues of the Italian gardens were seen in relief against a mountainous back-ground; and by means of these objects, and especially of the steps and terraces, the geometrical

style in Italy conformed itself to existing circumstances. In the landscape paintings of Italian artists, architecture and gardening are seen in harmony with natural features. On level or slightly undulating grounds, the buildings are plain and massive, and the gardens inspire ideas of quietness and composure. In rocky or mountainous scenery, the outlines of the buildings are broken and much diversified, and the trees and other garden objects convey ideas of pleasing intricacy and variety. In Holland, the style of gardening adopted was geometrical, but the Dutch variety of that style is peculiar, and such as could only be practised in a level country, abounding with canals. Were the picturesque style introduced into Holland, it would have to conform itself to the requirements of a level country. Smoothness, repose, and comparative tameness, would prevail over that boldness and intricacy, which belong inherently to the same style when adopted in hilly or rocky countries. Particular conformations of the earth's surface require not particular styles of gardening, but rather such varieties or sub-styles, as are found to be most suitable. In level countries, the geometrical style has its straight walks, avenues, and canals; in hilly countries, it has its terraces rising one above another, with their contour so broken or hid as to obviate the occurrence of lengthened horizontal lines. So also, the modern style alters itself as occasion demands. As has already been shown, gardening has thus adapted itself to circumstances in all ages—not, perhaps, from design or contrivance in the first instance, but rather from an instructive love of propriety on the part of ancient ornamental gardeners. It is only in modern times that the principles of gardening, as an art of imagination, have been much studied. The writers of ancient Greece, in describing the most commendable qualities of garden scenery, dwelt chiefly on "shade, coolness, freshness, breezes, fragrance, and repose." They speak little of picturesque beauty, or the poetry of form and colour. The age of pastoral poetry had to intervene ere gardening could take its place amongst the fine arts. However false the descriptions of rural manners given by the pastoral poets were,—however much these poets attempted to hide misery in a silver mask,—their writings served at least to show that a search in quest of moral beauty, sublimity, and loveliness, in the walks of lowly life, had been instituted. The oaten reeds of the shepherds, and the flowery garlands of the maidens of Arcadia, may have existed mainly in the imagination of poets; but that they so existed, was a proof that there also existed in the minds of men a desire for some indefinable good. The age of pastoral poetry preceded the age of mental cultivation, and of progress in the arts, and may have had a beneficial effect in counteracting modern tendencies towards gross utilitarianism. Pastoral poetry, and the study of the arts, have combined to forward the cause of ornamental

gardening. The one has stirred up man's inherent love of beauty, and the other has made plain the first principles thereof. The instances already given of the successful application of certain garden principles, in ancient times, show that what painters and designers call *taste* naturally exists in the human mind; and that, though uncultivated, if at the same time it be undepraved, its leadings will be in the right direction.

Unlike botany, geology adds but little to the materials of the landscape-gardener—to those objects which he may dispose and arrange. While ranging the world for trees, shrubs, and flowers, he cannot go beyond the neighbouring quarry for materials for an imitative rockwork—that is to say, a rockwork that is to have a semblance of nature. Fancy rockeries, intended to appear as artificial erections, may be made of any kind of stones, or even of scoriæ, or fused bricks; their avowed object being the culture of alpine and rock plants rather than scenic effect. Where it is desirable, in smooth scenery, to have the appearance of natural rocks, whether on the sloping face of a hill, or in courses for walks or rivulets artificially sunk in the ground, geology is fitted to instruct the designer, not only as to the kinds of stone to be used, but also respecting the way in which sandstone, slatestone, and limestone should be stratified, and the angles at which the blocks should be laid, so as to harmonise with the locality. A good effect may sometimes be produced by attending to such particulars; but, in all possible cases, mimicry should be entirely discarded from the art. Better it is to want rocks than to have an imitation of rocky scenery unartistically executed; and in all departments of art, imitation always ranks lowest, even when it is successfully practised. The general principles of design in the rockery department appear to be these:—when nature is to be imitated, geology must be previously studied; and when the rockery is to be avowedly artificial, the materials used must at least harmonise together—thus, roots of trees which are perishable should not be mixed with stones, the character whereof is durability. It has been said, with truth, that almost no description of garden ornament is more frequently misplaced or mismanaged than rockwork.

The landscape painter dislikes the glare of whitewashed houses in scenery; and it has been found that houses coloured with the natural tint of the rocks that may exist in their neighbourhood, have the most harmonious effect of any. There are, doubtless, exceptions to this, for the colours of some rocks are naturally harsh. Houses built from quarries of that variety of the old red sandstone, which is *really* and deeply red, require to be tinted with some other colour before they can please the eye of the painter.

Artificial lakes, meres, and rivers must appear to be natural ere they can please. Or, if a lake has been formed by throwing a dam

across a valley, the obstruction raised by art, from whatever point of view it is visible, should come forward conspicuously, so that the presence of art may be avowed, and that the means may appear sufficiently adapted for the destined end. Where a valley is crossed either by a mound of earth for a road, or as a dam for retaining water, the earth should be hidden by architecture. When this is done, the road from both sides, and the dam when seen from below, will assume the character of a viaduct; and the valley, being evidently crossed artificially, will suffer the less in its natural beauties —whereas, these would be irretrievably injured by a mound of earth, like that which crosses the noble valley between the old and new towns of Edinburgh, because it would appear, from certain points of view, a mode of terminating a valley which nature never employs. The outlines of water naturally conform themselves to the shape of the ground, being rugged in rocky countries, and forming gentle sweeps where the ground undulates gently. In the bend of a natural river, the bank, at the convex side, is convex or steep; and at the opposite or concave side, or longest side of the curve, the bank is also concave, being nearly flat where it joins the water. The windings of a river are thus accounted for; and in this and other matters nature must be copied wherever ground is altered in forming a sheet of water. To form a steep bank of earth at the concave bend of a river, would betray the blundering hand of art. It is characteristic of valleys and of streams to be narrower and deeper amongst mountains composed of primitive rocks than over the more recent formations; and, in the generality of valleys, the advancing angle of one side corresponds with an opposite retreating angle or hollow. Valleys vary in their breadth, and are generally tortuous. Some lakes occur near the summits of high mountains, but for the most part lakes occupy the lower parts of valleys, near the base of mountain ranges; and are deep near their shores when the banks are steep or rocky, and shallow where the banks are concave or nearly flat. As a general rule, the lowest part of the grounds will be chosen by the landscape gardener for being covered with water; and, in designing both the vertical and horizontal profiles of the banks, he will be guided by the natural conformation of the ground in the vicinity. There is one thing that is often neglected in the landscape garden—the waters of natural lakes or rivers are always separated from the grass on their banks by rocks, stones, or mud. Thus a warm comes between two cold colours. Let the designer always provide for this.

Before tracing the outlines of plantations on paper, it is required of the designer that he be acquainted with the profile of the ground, as it would appear in a section. Some grounds will be nearly level, or only slightly undulating; and for these the outlines on the plan may be comparatively tame, or wanting in that bold ruggedne

which ought to characterise the boundaries of a plantation in a rocky and much diversified country. Round-headed hills will be harmoniously adorned by plantations having gently sweeping outlines; but to attempt to trace the "line of beauty" in the rugged domains of the mica-slate would be spending labour in vain. In a tame country, approach-roads and walks may be laid down in straight lines or easy curves, and these accounted for by masses of trees or shrubs; but sudden turns on uneven ground may oftentimes tend to create a pleasing effect. In such matters as this the landscape gardener will be much aided by attending to the natural shape of ground, as determined by the character of the underlying rocky formations; and will labour all the more successfully if he has laid it down as a rule that art should study to add to what nature has already done, but not to seek for effect by means of violent contrasts. It is not by attempting to combine inharmonious forms or materials that a pleasing contrast can be created. Contrast implies change from one kind of scenery to another. The landscapes of Norway are described as being peculiarly diversified. Here they exhibit a sterile wilderness of rugged rocks and sterile precipices; —there they change to lovely scenes of rural quietude and beauty. Pleasant spots are doubly beautiful when they are found blooming in deep alpine solitudes; but in seeking to add to the beauties of such wilderness gems, the ornamental gardener will employ a style different from that which he would employ in their immediate vicinity, where the natural features of the landscape might differ in character—and differing still more greatly from that which he would adopt in a wide cultivated plain. It is not necessary that a modern park or pleasure-ground should be in all respects a fit subject for a landscape painting; but at the same time, it is of no little moment that the landscape-gardener should possess the painter's eye, and be actuated by the painter's spirit.

The kinds of trees planted should be such as will harmonise with the surrounding scenery. The cedar of Lebanon finds itself out of place in the grounds of the spruce modern villa; its form will not blend with the forms of the objects that surround it; and it seems to long for its native mountain side, where it may rejoin the exclusive group of its own species. Ossian admired the majestic pine on the mountain top; and poets of more modern times have been delighted with the beauty and fragrance of an avenue of lime trees, enlivened in the flowering season by the busy hum of bees; but let the lime be transferred to the frowning precipice, and the pine to the avenue in the cultivated plain, and both will assume the character of inharmonious intruders. It is worthy of remark, that those parts of Scotland which most nearly resemble, in geological character, the native alpine home of the larch, are also those in which the larch has been most successfully cultivated by Scottish planters. In the Lowlands, the larch is liable to failure, and it

harmonises not with the scenery. In the works of creation, utility and beauty were blended together.

Architectural style is more associated with climate than with the form of the earth's surface; but sometimes, in adopting the style of a foreign country, a regard to the character of the scenery ought to form a matter of primary consideration. A Swiss cottage would be in some respects out of place in any part of Britain; but if introduced at all into a British landscape, those parts of the country which have most of an alpine aspect should be selected. To place a Swiss cottage in the middle of an English plain, or to erect a building having the appearance of a Hindoo temple in a Highland glen, would be to attempt the reconciliation of contraries, or the amalgamation of antagonistic materials. Where the features of nature are peculiarly bold or striking, it would be well for architecture to refrain from inviting a share of attention. A tower or obelisk, on the summit of a majestic rock or mountain, becomes the more an object of ridicule the more that the scenery of nature around and under it partakes of the grand or the sublime.

Geology, by itself, is insufficient to enable a farmer to judge of the fertility of an unvisited farm. A geological map will not stand the farmer instead of a personal visit, when he designs to offer for a farm in a distant part of the country. There are local peculiarities about every farm which would require personal inspection. But a map of the kind referred to is well fitted to give a general idea of the fertility or barrenness of a country-side. Thus, no person possessing and understanding such a map would expect that the pasture farms over the granite of the middle and eastern parts of the Grampians might be converted into arable grounds for growing corn chiefly; or, that the peat soil over the gneiss of the outer Hebrides could be cultivated with as great success as similar soil over layers of diluvial clay and gravel, and incumbent on rocks more favourable to the corn-growing farmer than gneiss. So, also, a knowledge of the geological structure of a country may be of service to the landscape-gardener, but it must be combined with other kinds of knowledge. Rules, applicable to each variety of surface, might be laid down; but these are unnecessary where the designer has made the beauty and harmony of lines and forms his careful study.

In geological arboretums, which are best formed on irregular ground while level ground is best adapted for botanical arrangement, the various families of trees are planted on their favourite soil; and the effect may be heightened by the introduction of artificial rocks, not on the flower-garden model, but in imitation of the edges of natural strata, or of upheaved and broken masses of the primary formations. Where diversities of soil exist, geology may combine with botany in directing the planter of an arboretum. In many cases, almost all the trees in a natural order have kindred

partialities in regard to soil, both in the distinctive name, and the relative wetness or dryness thereof. Thus while the willows, the poplars, and the ashes, prefer a soil that is rather damp, the birches and the hornbeams take better with one that is dry and gravelly.

Analysis of Soils.—One objection, which is often made to the analysis of soils, merits some attention. It is argued that, as the surface of a field is changing at almost every step, when you take a sample from one square yard, you are by no means sure that it at all agrees with the next. A field is not a crystallised mineral of definite composition—it is a confused mixture of various substances, perhaps deposited at random from water. This objection however, fortunately, only has weight where absolute exactness is required. A similar objection applies in nearly an equal degree to the analysis of rocks, and yet it is found useful to know the composition of field-spars, micas, and granites. Not that it is for one moment expected that the morsel of these rocks which may be examined agrees with the rest of the rock; the *average* composition of these rocks is the information sought, without pretending to arrive at a degree of exactness which does not exist.

It is the same with the analysis of soils, but with this difference, that the mean composition of soils brought from different situations will often vary to such a marked degree, as to convey nearly the same amount of information that would have been derived from the analysis, if even extreme exactness had been possible. Having thus reduced to its just importance the degree of exactness requisite in an analysis of a soil, it must be admitted that its usefulness, thus fairly estimated, must be limited to an extent varying with the special locality. For instance, in some neighbourhoods the soil will vary, most unfortunately, perhaps half-a-dozen times in one field, whilst in others no change can be observed over many hundred acres. In this, much must always be left to the judgment of the farmer; and whilst it undoubtedly qualifies the advantage to be derived from the chemical analysis of a soil, yet it far from justifies any one in concluding hastily that no information is to be derived from it.—GASPARIN, *Cour d'Agriculture.*

The Failure of Broad Clover.—There is no crop which the farmer cultivates upon which he can calculate with so little certainty as the broad clover. The answer usually given to an inquiry as to the cause of this evil, has usually been that the land was "clover sick." This plan of giving a difficulty a name, instead of explaining it, has been so often adopted, even in what are called the exact sciences, that we need not be surprised at its use in agriculture. It has been suggested that the failure may be caused by the want of some mineral ingredient in the soil, neces-to the perfect development of the clover plant. This explana-

tion is nearly as unsatisfactory as the preceding one. We have seen every sort of artificial manure, lime, compost, and farmyard dung tried, but without producing the slightest effect upon the gradual and steady diminishment of the clover crop. Besides, we find that the land which refuses to grow clover will yet produce remunerative crops of peas or beans—plants which, belonging to the same natural order, *Leguminosæ*, as the clover plant, requires the same mineral manure. That there may be differences in the chemical constituents of these plants is not denied, but chemistry has not yet satisfactorily discovered them.

Perhaps we may arrive at some more satisfactory solution to our difficulty, if we trace the changes which every farmer must have observed in his clover fields. At the very outset, then, is a difficulty to which I can offer no solution. During this autumn, (1849,) I was very much surprised to find my clover crops looking very thin and poor after wheat. This I was at first disposed to attribute to the bad quality of the clover seeds sown, but when we cut the spring wheat and barley, every part of the field was found to be covered with a vigorous growth of clover; and as the same seed was sown in both cases, the failure could not be attributed to it. I am inclined to think that the failure in this case may partly (if not entirely) be owing to the want of a proper cover having been given to the seed sown on the wheat, as the land was hard and baked, from having been sown when very wet in the previous autumn. The clover seed sown along with the spring wheat and barley would be much better covered, as the land was then dry. I have only alluded to this part of the subject for the purpose of saying that sufficient care is certainly not bestowed upon the clover at the first outset, by giving the seed a good cover.

But supposing the farmer finds a good prospect for clover when his corn is cut, and occasionally during winter, in his walks over his farm, everything looking well up to April or even May—when, in the course of a few days, his clover most mysteriously and most capriciously disappears. We say capriciously, for the clover is ultimately vigorous, and altogether awanting in the same field, when not the slightest difference in soil or previous management can be assigned as a reason.

For the failure of broad clover, the only palliations—for remedies they cannot be called—which I have found to be of any service, have been deep ploughing, and introducing beans or peas into the rotation, so that clover may be grown on the same ground only once in eight years, instead of once in four years as usual.

Until this last season the growth of beans and deep ploughing so very seldom failed to secure a good crop of clover, that I was inclined to place this plan amongst the axioms of farming. But the clover has so completely failed on my farm this last year, that some other solution of the difficulty must be sought.

I accidentally met with a notice of this subject in an old French work, entitled *L'Agriculture Practique de la Flandre*, by J. S. Aelbroeck.* The failure of the clover is there attributed to an agent which I have never before seen mentioned. The mistletoe is well known as a parasitical plant, which grows on the oak and other trees. The clover and other plants of that species have also parasitical plants, which, like the mistletoe on the oak, derive their nourishment, not from roots of their own, but from the plants to which they attach themselves. The author above alluded to thus describes the clover parasite:—The Orobanche, or broom rape, (*O. major*, *O. vulgaris*, *L.*) is a parasitical plant—that is, it attaches its roots to those of other plants, instead of fixing them in the ground. The seed of this singular plant vegetates, as usual, in the ground, and the plant grows to some height, when its connexion with the ground is broken, and a new root formed and fixed on an adjoining plant. It is mostly found on the roots of clover, hemp, and broom, and most frequently on poor soils. The second crop of clover seems also to be more liable to it than the first. Strong clay soils are less subject to the growth of this parasitical plant than lighter soils, and the clover grown upon them is often so vigorous as to survive any slight evil produced in the first crop, but not always able to do so in the second growth. Dry seasons (as being most unfavourable to the vigorous growth of the clover plant) are most favourable to the spread of the broom rape. It appears to be indigenous to Flanders, though it has only attracted attention during the last forty or fifty years. Since that time it has gradually spread more and more, until, in some parts of that country, very serious injury is done to the clover crop.

Within the last few years these facts have excited great attention, and several memoirs have been written on the subject. The information they contain is chiefly botanical, so that no further notice of these memoirs can be interesting except to extract the information they contain respecting the destruction of this pest to the farmer, and to suggest such other methods as have been found successful.

The last memoir is by M. Von Hoorebeke,—1. It is there stated, that according to a M. Bosc,† that the brown rape is multiplied by seed, and that the only method of destroying it is by plucking the plant before the seed arrives at maturity. 2. That M. Michelli of the Grand-duchy of Tuscany, having seen the farmers in that country excessively tormented by this plant, circulated a memoir amongst them, recommending precautions similar to those suggested by M. Bosc. M. Von Hoorebeke confesses that these recommendations are nearly useless, on account of the expense involved. Besides, all attempts at extirpating this plant

* Paris, 1832.

† *Enc. Meth. Agriculture*, T. V. 2d part, page 491.

by hand-weeding have always failed; and, if ever partially successful, there is no doubt but that the seed of the broom rape is mixed with the seed of the clover purchased by the farmer—thus effectually neutralising all his efforts at getting rid of the pest by the most careful hand-weeding on his own farm.

It has been asserted by some that the early autumnal frost destroys the broom rape; but this can in no way contribute to the destruction of the plant, for the seed has then ripened and fallen to the ground.

"The remedies which I have to suggest," continues the author, "have only been partially successful; but even this boon is not to be neglected. The point to be obtained is, to destroy all the seed of the broom rape present in the soil, and to take care that none be present in the clover seed purchased. If these two requisites are obtained, no further harm can be done to the clover crop by this plant. In every one case I completely succeeded. I took a plot of ground on which no clover (and consequently no broom rape) had grown for ten years, and ploughed it very deeply, hoping by this means to destroy any seeds that might have been left in the soil, by burying them too deeply to vegetate. The next point was, to be equally sure that my clover seed was pure. This also I succeeded in effecting by the following very tedious process:—In the months of August and September of the preceding year, I procured some seed of the broom rape, and mixed it with the clover seed. Upon examining the mixture with the microscope, I found that the broom rape seed had attached itself to the clover seed. This mixed seed was divided into two portions, to one of which was added some ashes, and well rubbed together with the hand, in order to detach the two seeds from each other. The mixed seed and ashes were then put into a vessel of water, well stirred about, and then left to settle. The broom rape along with the ashes rose to the top, and was removed; the clover seed settled to the bottom. This was repeated with fresh water two or three times, until I was satisfied that all the broom rape had been again separated with the water. The seed thus purified was then sown on part of the land above alluded to, and by its side that portion of the clover seed which was still mixed with the broom rape seed. I then reasoned thus with myself,—If now I find the parasitical plant equally on both portions of ground, I have then deceived myself as to the efficacy of my arrangement for purifying the clover seed; but if I find that the broom rape appears only on the portion sown with the clover that is mixed, my arrangement for cleaning the seed has then answered my expectation. The result was successful, as it always has been in every case in which the experiment was tried. I never once failed of success."

I am inclined to think the author of the above remarks has mistaken the species of the plant he has described. At least Smith, in his *English Flora*, says that the *Orobanche major* is only found

parasitical on broom and furze, but that the *Orobanche minor* is found in clover fields. This is, however, only of importance to botanists. A drawing of the latter may be found in vol. vi. of the *English Botany*.

But besides this broom rape, I find there is another parasitical plant, of a different genus, which also injures the clover plant: it is the *Cuscuta* or dodder, which is described as "a genus of plants which, fixing themselves on the branches of woody or other plants, twisting round them, striking a number of minute suckers down upon their bark, and thus attracting both from the system of the plants, to which they fix themselves, and from the air, the sustenance necessary to their own support. Hence they are true parasites."

The common dodder, *Cuscuta Europœa*, may be seen growing on nettles and furze: it is a reddish-looking annual, without leaves, and with white bell-shaped flowers.

"The dodders are very dangerous to the fields of leguminous plants, (as peas, beans, or clover,) which they attack, and upon which they multiply with singular rapidity. It is difficult to guard against them on account of the rapidity of their vegetation, the facility with which they *pass from one plant to another*, the abundance of their seeds, and the double power they possess of germinating either in the earth or in the capsule."*

These plants are thus described in a paper by M. C. Babington in the *Annals of Natural History*, vol. xvi. 1845. He says, "The *Cuscuta Epithymum* is parasitical upon leguminous plants; of late years it has occurred so frequently upon clover in Norfolk, Suffolk, and Essex, as to have completely destroyed the crop." In *Loudon's Gardener's Magazine*, it is stated that "the seed of the *C. Europœa* is not unfrequently amongst Dutch clover seed, and that the plant is a great nuisance in Holland and Flanders." An Italian naturalist also mentions it as a pest to the clover fields.

I will only further add a description of a similar plant which is parasitical on flax, and is thus mentioned in the *British Association Report* for 1839:—"When it has fixed itself upon the flax, the root and lower part of the stem shrivel up and die away, and a group of little warts or tubercles is produced from the inner surface of the spire between each head, which strike into the flax and extract its juices. This singular economy places each head nearly in the situation of an independent plant; so that if the stem were separated at intervals, each detached portion would continue to flower and to ripen its seed."

Such, then, is the information I have been able to glean respecting these singular plants, and I am thoroughly convinced that their growth is one, at least, of the reasons of the failure of the clover crop.

M. B.

---

* *National Cyclop.* art. *Cuscutaceæ.*

The Making of Composts. By M. Giroux. Communicated by M. De la Rive, Geneva.—I have come to the method by which I increase my stock of manure—partly from experiments of my own, partly through the reading of agricultural journals, and partly through the suggestions of some friends. At any rate, I have found that method highly successful; and I am most willing to give a full account of the way I proceed, hoping that other farmers may benefit by it, as I have done.

First of all, I have tanks, tubs, &c., in which I collect all the urines, the liquid manure, and the rain-water—the more the better, as long practice has taught me that nothing is better; and to the farmer it is a real treasure, which increases in value the longer it is kept. This liquid manure is required for the making of solid manure. However, should it be difficult to collect liquid manure, a mixture may be made which might replace it. In that case, rain-water should be collected in tanks, the surface of which should be large, whilst their depth is small, so that the sun and air may act the sooner upon it, and hasten its corruption. In this water I throw weeds, useless roots, green plants, rubbish of all kinds. I would especially recommend for that purpose euphorbia, tamarisks, and all lactiferous plants. In winter, when such plants cannot be procured, I replace them with the leaves of evergreens, such as pine, fir-tree, box, ivy, moss, &c. To the mixture thus prepared I add quicklime and sal-ammoniac, in the proportion of 10 lb. of quicklime and 5 ounces of sal-ammoniac to about 200 gallons of liquid. Although I mention these proportions as those I have made use of, yet what I say must not be taken as an absolute or general rule: each man must act according to his own resources, and his own wants. What I wish to show is merely the principle; for the application I have made of it may often be far from being the best. I will further remark that the tanks should not be too deep—about four feet is quite enough; and the several reservoirs constructed should be placed a little elevated above the adjoining one, so that the contents of the first may be easily emptied into the second, and so on.

We are now in possession of one of the necessary elements in the manufacturing of my manure; and I will suppose we have either liquid manure or corrupted water, prepared as above stated, in sufficient quantity.

Suppose, then, that we wish to make about two tons of manure: for that purpose I begin by taking about 200 gallons of liquid manure, or of corrupted water; and to this I add—

200	lb.	of human excrement, or urine.
50	—	chimney-soot.
400	—	dry lime.
60	—	limestone.
20	—	wood-ashes.
2	—	sea-salt.
1	—	saltpetre. (In all, 783 lb.)

To this mixture add 50 lb. of the ferment kept from the preceding operation: but, in case this is the first time that you have thus prepared manure, you must increase by one-fourth the quantity of each of the solid substances mentioned above, making the entire mass 916 lb. If the soil be light and sandy, I have often found it expedient to add some clay, in order to give greater consistency to the liquid mixture, and more firmness to the manure.

I will tell you how to do, if you cannot procure some of the matters I have mentioned. Instead of 200 lb. of human excrements, you may put 40 lb. of fermented barley or buckwheat, or 100 lb. of sheep-droppings, or 200 lb. of pig or cow dung: 100 lb. of burnt soil will replace the 50 lb. of soot, and 2 lb. of potash will do instead of the 20 lb. of wood-ashes. It is better to put rather more than less of these different elements; and I need scarcely say that it is well to add to the mixture the poultry-yard manure, pigeons' dung, rape-seed cake, and such other beneficial substances as can be procured with ease, and without great expense.

The place in which to mix these ingredients must be chosen near the tanks, and it should be paved, in order to lose as little as possible of the liquid; and it is important that it should be on such a slope, as that the liquid running from the watered manure may fall into a cask or tub placed at the lowest part of the slope. Part of this liquid may be kept, to be used as a ferment in the ensuing year. I must not forget to mention that the liquid manure should be often thoroughly mixed by means of a curved spade. Monsieur Jauffret, a French agriculturist of note, from whom I have borrowed part of this process, used to build up his manure on a wood grating, through which the liquid escapes more easily, and the action of the air is increased. The same result will be obtained by employing small bundles of branches and wood, upon which the manure may be constructed. To make the manure, all kinds of young shrubs, leaves, reeds, &c., can be used, together with straw. A bed of common grass will be often required to increase the fermentation. If you have sufficient time, I advise you to cut the straw; and as for the ligneous matters, such as whins, small roots, &c., their length must not exceed 8 or 9 inches.

Everything being ready, you may build your manure-heap about 21 feet long, 8 in breadth, and 7 in height. This is merely an average size; and it is quite evident that it will be of no consequence if the heap should be a little larger or smaller. Next put a bed of straw, reeds, &c.—over the branches, &c., which are laid upon the ground—about 1 foot thick; then water it thoroughly with the liquid: if possible it is better to soak the dry elements of the compost in the tank, and, as you take them out, build them upon the heap. Then [illegible] second bed, another foot thick, and water it as before, and [illegible] until the heap has attained a sufficient height [illegible] it well trampled down. Each bed

having been separately trampled, then spread on the top the mud that is found at the bottom of the tank, after which you cover the whole with a bed of soil or chaff, a few inches thick.

On the fifth day after these operations have been completed, the manure will be pretty well drained, and you may then turn it over, so that the top bed of the old heap be the bottom of the new. This being done, you have the heap watered as thoroughly as possible, and then immediately covered, as before, with a bed of soil or chaff.

On the seventh or eighth day the compost will begin to smoke, especially in the morning, and a strong smell of manure will be felt. You then bore holes in it with an iron auger an inch and a half in diameter, and about 5 feet and a half in length—the holes must be 3 feet deep, and 6 or 7 inches distant from each other—and you then water the heap with liquid manure through these holes, and immediately afterwards close them, merely by the pressing of the foot, when you lay a new bed of soil or chaff over the whole compost.

On the ninth or tenth day you bore new holes, deeper than the first, and, as much as possible, in different places; you then water the heap by these new holes, and have them closed in the same way, and lay a new bed on the top as formerly. It is to be remarked, that all these new beds are themselves soon converted into manure by the watering, and the fermentation of the compost. If the compost is merely made of straw, you had better stop the fermentation at 134°, and that by means of an abundant watering; but if there be any woody matter amongst it, let the fermentation go on to 183°. In this manner the compost is prepared, and ready to be used at the end of a fortnight in summer, and of three weeks in winter. Although, by being often watered, the manure will keep for any length of time, it is better to make use of it as soon as it is ready.

I have sometimes made use of the liquid contained in the tanks in another way, which I have found to be very beneficial. I had a heap of loose earth, which was watered from time to time, and thoroughly mixed by means of a mason's shovel, handled by one man, whilst another with a spade cut the edges, and threw them into the heap. When once the mixture was well prepared, I put it in a heap, and had this new kind of mortar spread in very small quantity over some natural meadows, in the month of November. Although it became very dry by being long kept, it was broken into small bits with the greatest ease, and thus spread upon the land.

Instead of waiting a long time for a compost, as I am obliged to do by the ordinary process of preparing it, I have made, in the space of twelve days, a very good compost in the following manner:—I spread a bed 1 foot thick of my manufactured manure, then a bed 6 inches thick of loose earth, over which a bed, 1 foot thick, of farmyard dung, 6 inches of loose earth, and so on, until

the heap is about 7 or 8 feet in height. Immediately it is watered by means of holes bored in it in the way I have before described; and having repeated the waterings three or four times, I obtain a compost, of the very best description, in the course of about a fortnight.

*Young on Wire-Fencing.**—The improvements in agriculture, and more especially in landscape gardening, as applied to the arrangement of the park and pleasure ground, have long produced pretty general dissatisfaction with the modes of fencing in common use. Stone walls are expensive, and in many situations displeasing to the eye by intercepting the view, and giving a formal and checkered appearance to the landscape, opposed to the freedom and simplicity of nature. The same objection applies, to a certain extent, to thorn hedges: these are, besides, of slow growth, requiring for a length of time to be themselves fenced, difficult to keep in good order, and in many situations they will scarcely grow at all. Hedge-rows, with their accompanying ditch, and rows of trees, often pollarded in England, occupy a large space of ground; and are considered noxious by affording a safe harbour to what farmers delight to call vermin. As they exist in England, these hedge-rows are, of course, indispensable on the score of economy; but they are often very beautiful objects in spring and summer. We have seen them, in the southern parts of England, forming large mounds of rich vegetation: the higher parts a mingled mass of wild roses, honeysuckle, convolvuluses, lathyrus, and occasionally the black briony, (*Tamus*,) one of the most graceful of our native plants; while the lower parts formed a perfect mosaic of speedwells, saxifrages, geraniums, and plants of humbler growth. And what a resource to all the small creatures that frequent the fields! To the birds they afford a good hiding-place for the nests in summer, and abundance of food in their berry-bearing bushes in the winter; while insects and numerous small quadrupeds at all times find here a ready retreat, where they may dwell in comparative safety. But all these humble denizens must shift their quarters; we cannot afford to lodge them so expensively. For it is at a great expense they are thus accommodated, if the calculation be correct that *one-tenth* of the land under cultivation is thus occupied, and another tenth is rendered useless.

The necessity for economy, in a matter of fencing, both in regard to space and means, had, according to Mr Young, been long felt by landed proprietors, before any proper method of carrying it

* *A Short Treatise on the System of Wire-Fencing, Gates*, &c., as manufactured by Charles D. Young & Company at their several establishments in Edinburgh, London, Liverpool, and Glasgow. With explanatory copperplate engravings. To which is appended an Illustrated and Descriptive Catalogue of their manufactures in connexion with landed property, &c. By Charles D. Young. Edinburgh: 1850.

into effect had been devised. "Still less, with the prominence naturally given at first to purposes of practical utility, were those of beauty likely to be kept in view; while least of all was it thought possible, easily and conveniently, to combine them both. The strictly commercial tendencies of the age, which not even those apparently beyond their influence could altogether escape, directed the course of improvement for a period towards merely profitable objects; the leisure or inclination which men of the highest standing had to spare, from the engrossment of politics, was given generally only to the more obvious and palpable requirements of their property, while the tone of sentiment itself was thus suggested to others. Hence it was not unfrequent for the domain to exhibit at once the most incongruous characteristics of the farm, the park, and pleasure-ground; or else in one case the farm itself, with much of its rusticity and uneconomical system, obtruded upon the manor—and, in the other, those who preferred the gratification of the eye, although adapting their arrangements to modern taste, were still guided by imperfect conceptions of the highest principles of natural beauty." This artificial taste, according to Mr Young, was succeeded by one more natural; and in the arrangement of grounds and scenery to advantage, that which was most simple, least modified by superfluous incumbrances, and most useful, came to be the object aimed at. The practical improvements in agriculture, the great proportion of land retained as park and pasture in the hands of its owners, as well as an increase in the size of farms, all combined to render an improved kind of fencing desirable. To meet these wants, wire-fencing is regarded as peculiarly adapted: it is not above twenty years since it was first introduced, and its advantages have been found to be such, that it has made rapid progress. Not only has it been extensively adopted in Britain and Ireland, but also in America, and in our East and West Indian possessions. Its advantages, in an ornamental and practical point of view, are thus stated by our author:—1st, The tendency of its very leading principle to preserve, in the scenery it intersects, to whatsoever extent, the idea of inartificial completeness, while yielding every benefit of the height of art; and that in conformity with the principles of modern landscape gardening itself, which consist in eliciting the natural features of a property by allowing nature her full freedom, by aiding and accommodating the nature of her development. From a greater or less degree of tenacity, up to perfect invisibility at a short distance, the stronger as well as the intermediate uprights can be so arranged, and the whole painted to suit the situation, as that, amidst the utmost intricacy of enclosure, not one of its outlines comes into notice. The whole is thus complete without being observed,—successful in its object, so as, apart from aught else, to strike the spectator with a sense of mechanical perfection; and the distinction is fully preserved between simple elegance and

the mere picturesque rudeness so appropriate at least to aristocratic domains. 2dly, The simplicity and lightness to the eye, when near, of this plan for protection and enclosure. 3dly, In its replacing what was itself, in many cases, a positive deformity, and substituting a uniform system instead of it. 4thly, In its affording scope for a variety of ingenious expedients and combinations with reference to local or accidental circumstances—the flexibility with which, by the smallest expenditure of means, this method adapts itself to the peculiarities and overcomes the obstacles of situation—having the tendency to gratify that sense of facility which is natural to cultivated taste. 5thly, The perfect precision and regularity with which its construction is carried out. 6thly, Its enabling advantage to be taken of the new principles of landscape arrangement as well as of agricultural economy, combining the two in conformity with more agreeable associations. 7thly, Its providing to some extent a means as yet undeveloped in its capabilities, accomodating many of the felt discrepancies between the interests of cultivation and the just rights, as well as the interesting features of game preservation.

In considering the economy of such a system of fencing, its durability is an important consideration. We should have been pleased to see further evidence on this head, but as the system is comparatively recent, the test of time cannot well be applied to it hitherto. We are assured that fences, put up many years ago, are now as substantial and effectual as when first taken off the workmen's hands; and that, while strong and heavy iron fences and iron hurdles, at three times the price, have given way, wire fences erected at the very same time were in perfect condition. When wooden uprights are employed, they cannot be much more permanent than the posts of a wooden paling similarly prepared. It is true that the pressure from wind and storms, which bear so heavily on the bars of a wooden paling, is scarcely or not at all felt in the case of a wire fence; and this circumstance will contribute to the durability of the uprights. They have comparatively little weight to carry.

The invisibility of a wire fence, as shown by Mr Young, is in many cases a great recommendation. To have cattle or deer prevented from encroaching too closely on the more ornamental portion of a domain in the immediate vicinity of a mansion house, while the means of so doing does not meet the eye, the view in no degree intercepted, the idea of restriction or confinement completely avoided, the access of light and air in no way impeded, are obvious advantages; and it is in such cases that wire fences appear in the most advantageous light. But there appears some reason for apprehending that inconveniences may arise from them, when used for enclosing ordinary fields, in which cattle and other animals are accustomed to graze. When galloping and chasing each other about the field, more especially in the dark, and seeing no obstacle

in the way, it seems probable that they will at times rush against the wires with great violence; and although we are assured that from the elasticity of the wires, they speedily recover their former position, and sustain no injury from the shock, it seems very questionable whether the cattle themselves come off so scathless from the collision. The fact that the wires have been subjected to this test, is a proof that the occurrences referred to have actually taken place, as we would infer *a priori* from the circumstances of the case. These fences also, cannot be considered as keeping the animals in two adjoining fields altogether apart. An obstacle occupying so small a space admits of them coming close up to each other, and vicious animals may find the means of injuring each other through so slight an impediment. Lambs, we have occasion to know, often find their way through between the bars, and if these were made so close as to prevent this (which of course might be easily done) the expense would be greatly increased.

In places where we have been accustomed to see a substantial fence, a stone dyke, or a hedge, as, for example, by the side of a turnpike, we never witness wire fences without feeling our *eye* seriously offended. There stand the posts in regular array, but, as far as the sense of sight is concerned, they have no meaning: and it is not till we have recourse to our reasoning faculties that we become convinced that they are serving a useful purpose. Our public roads, moreover, often run along the sides of hills and near precipices, where there is not only a feeling of security, but a real and positive safety arising from the danger being masked by an opaque fence: in the case of horses, a seeming danger often becomes a real one in such circumstances. The external boundaries of fields also should be marked by a fence which addresses itself to the eye; it looks like the framing of a picture, without which it is incomplete: and shelter from wind and storm is almost always needed in such situations.

And this leads us to remark that wire-fences are altogether useless when shelter is required: this is an advantage which, from their nature, they do not profess to afford, and must be taken into account when the merits of different kinds of fences are canvassed.

Although for these, and certain other reasons, we are not disposed to concur altogether in Mr Young's eulogium, there is certainly much truth in the latter part of the following observations as to the enclosing of large sheep farms:—

Finally, *its peculiar adaptation to every purpose for which fencing is required*, in conjunction with its other advantages, is such that it will undoubtedly in a short time almost entirely supersede all the old systems, and ultimately be the only one that can permanently maintain its position, as being the most efficient, durable, and economical that can be erected for every purpose required by landed proprietors; as a substitute also for stone walls, wood palings, hedges, and common post and rail fences for railways, both those in the course of formation, and on the old established lines, where enclosures on the former systems require periodical renewal, from decay of material or insufficiency of construction.

Even for purposes to which fencing has not been applied on account of its expense, extent, and inconvenience, from prejudice, want of invention, or local obstacles—and to the supplementing, in a great measure, of old-fashioned usage, from its now admitted and proved advantages—we take the opportunity of recommending attention to wire-fencing in some of its numerous varieties. As in the case of extensive sheep farms in the Highlands, Borders, &c., where thousands of acres have no enclosure or division at all, at least of an adequate nature, and where the stock must be actively superintended by a continual force of shepherds and dogs—a system often attended with serious consequences and heavy loss, as has been proved, and can be certified by many practical men from actual experience—the calculation is that the loss caused by *depreciation in weight*, from being disturbed in attempts to bring them together for the purpose of counting, examination, smearing, shearing, &c. &c., amounts often to a full pound weight each sheep on each occasion of the kind; independently of other deterioration and the heavy expense attending upon the employment of so many persons for their care. This would take place no longer to any extent were a system of fencing to be introduced in such districts, which might both facilitate the management of the stock, and divide one flock from another. The practicability of a plan of this nature has been not only suggested, but adopted by good authorities; and to others, from the exclusive advantages offered by wire-fencing, it can be confidently recommended for attentive consideration.—(p. 12.)

In Mr Young's most beautiful and elaborate work, ample details respecting this system will be found. The work is so profusely illustrated by means of copperplate, woodcuts, &c., and is brought out in so handsome a style, that we fear the expense will keep it from many who would wish to consult it. The application of wire-fencing to flower-gardens, ornamental grounds, shrubberies, nurseries, &c., is equally effective and beautiful. As a protection against hares and rabbits, nothing can be put in comparison with it. It may be rendered very valuable also for horticultural purposes, for training plants, forming screens or blinds for creepers and climbers. It admits of a useful application also in training and supporting standard fruit-trees, by means of an espalier constructed of iron and wire. In such cases the wires are generally galvanised, or made of copper, so that they never require painting, and are very durable. But for further details we must refer to the work itself, which is so complete and satisfactory as to leave nothing more to be desired.

*Lineham on Draining, &c.**—This is one of the numerous works that have lately issued from the press relating to drainage and the other methods of improving land. If Ireland be behind in agricultural improvement, it cannot be owing to the want of practical men; we believe that the majority of works on the subject have appeared in the sister island. The present seems to be one of the most elaborate; it is entirely of a practical description, and abounds in rules and computations, which cannot fail to be eminently useful

---

* ***The Drainage Engineer and General Land Improver:*** **a practical work on land and rivulet drainage, conveying of water, subsoiling, embanking, reclamation, and remodelling of estates, water power, &c., &c. Illustrated with expensive engravings. By JOHN LINEHAM, C. E., Surveyor, Valuer, and Improver of Estates. Dublin. M'Glashan, 1849.**

to land improvers. Extensive and comprehensive tables and illustrative plates accompany the work, by which the principles laid down are rendered more intelligible, and the labours of the practical engineer greatly facilitated. Mr Lineham, who has acted in his professional capacity in many different parts of Ireland, appears to be intimately acquainted with the subject on which he writes, and draws his observations from a wide field of experience. The author is of opinion that erroneous views and opinions on the drainage and improvement of land are very generally prevalent in Ireland; and he has applied himself towards guarding against the present reckless misapplication and waste of capital, and towards uniting efficiency with great economy in all such operations. He states that the climate of Ireland, though mild and genial, is admitted on all hands to be the dampest; and its soils, though remarkably fertile, the wettest of any other country in Europe.

A work of this kind, consisting in a great measure of rules and examples for the practical worker, does not afford much matter for extract; but we may give the following observations on subsoiling, as a specimen of the author's manner of handling his subject:—

By subsoiling is meant the operation of loosening or breaking up of the impervious crust or stratum (called subsoil) on which the cropping or active soil rests. This operation is quite essential in connexion with drainage of the stiff, retentive clays, which are too compact, in their natural state, to admit a speedy escape of the water to the drains. Subsoiling facilitates the escape of the stagnant water of the cropping soils with its noxious acids, at the same time that it exposes the surface and subsoils to the ameliorating influence of the frosts and rains.

The great benefits resulting from judicious subsoiling may be enumerated as follows:—

1st, Makes the drains effective almost immediately and permanently—for the soils rarely harden after being once broken up; enables the crop to be put in, and got off, much earlier.

2d, Is the first and great step towards increasing the depth, and improving the condition of all light, bad soils. In the subsoils, when improved, will most generally be found most valuable ingredients, which might often be wanting or entirely deficient in the cropping soil.

3d, Admits the atmospheric air to penetrate and circulate freely through the soils; the carbonic acid gas—the great food of plants—to the roots of the growing plant; and the oxygen gas to act on the deleterious, ferruginous compounds and secretions to be found in the soils of most wet lands; will secure to the soils benefit from every drop of rain that passes through the atmosphere.

4th, Will be found an important means for keeping down weeds, and also for putting an end to the destructive ravages of insects.

The latter, because many of these innumerable tribes—the turnip-fly, for example—are constantly changing from the full-grown, or perfect state, in one form, to the embryo state of the next, and if disturbed at the latter period, will be prevented coming to maturity. The eggs of the full-grown insect or caterpillar,* in one state, are deposited on the soft, pulpy leaf, or stem of the plant; then, after a certain time, drop to the ground,† and intermingle with the surface soil, where generated within atmospheric influence. The winter's cold instinctively drives them to seek shelter in the vegetable mass of the soil, (entering through the pores, tuberous rootlets, decayed stems, &c.,) where they remain in torpid seclusion until the rarified atmosphere brings

* It is scarcely necessary to say that caterpillars never lay eggs.—Ed.

† That is to say, the caterpillars drop to the ground; or, if the author means otherwise, his statement is erroneous.—Ed.

them forth to resume their destructive work: therefore, disturbing their retreats by upside-down working of the soil, the winter's exposure, together with being enveloped in the subsoil, (so new and foreign to their habits and nature,) must tend to their annihilation.

Most subsoils, in their natural state, are more or less impregnated with acids and secretions, which are most obnoxious to all useful plants. We perceive the plant, in favourable seasons, progress beyond our expectations for a time; but no sooner do the tender roots and fibres approach the deleterious matter of the subsoil, than they often droop and perish; then, mixing such subsoils suddenly and largely with the cropping soil must neutralise its action, and be fatal to vegetable life. Therefore, the proper principle of subsoiling is that which breaks up the subsoil, leaving it still in its place until sufficiently prepared to be added in proper quantity to the cropping soil, by subsequent digging or deep working. As before observed, a *full* spit of the subsoil should be so improved as to be ultimately availed of, which will enable the upper soil, exhausted by a rotation of cropping, to be replenished from, or replaced by the spit beneath.—(p. 179.)

*Gourcy's Agricultural Tour in Belgium.**—This gentleman, who appears to have paid much attention to agriculture, and has written a good deal upon it, repaired to Brussels to attend an agricultural meeting on the 21st September 1848, but having made a mistake as to the date of the meeting, he was disappointed, and afterwards made a tour through different parts of the country, of which the present volume is an account. He was anxious to become personally acquainted with the skilful cultivators of that country, for he is of opinion that they turn lands in general to the best possible account, and can extract more from the poorest kind of sands than most others. He had an opportunity of attending a horticultural meeting, and is of opinion that in rare plants, and very fine legumes, and particularly enormous collections of magnificent pears, the exhibition greatly surpassed a Parisian one. He there saw an immense variety of potatoes previously unknown to him, monstrous red-cabbages, beautiful carrots, many varieties of turnips, rutabagas, and kohlrabis, among what were the best species known in England. One specimen of beet-root measured a metre (39⅜ inches) in length, and was proportionably thick. Count Gourcy speaks very favourably of a plough, manufactured by M. d'Omalins, of Anthine, near Liege, who has a manufactory of agricultural instruments at that place; but he thinks that a plough brought from Aberdeen, and preserved in the Agricultural Museum at Brussels, will be better adapted to the working of heavy lands.

In traversing Belgium, Count de Gourcy remained for a while at numerous places, and examined the principal farms in the neighbourhood. It does not appear to us, however, that there is much in his accounts of them that can be of much interest or utility to the British farmer. The following extract from a letter of M. Vanderplanke, a skilful Belgian farmer, addressed to the

* *Voyage Agricole en Belgique et dans plusieurs departements de la France, suivi de quelques articles extraits des Journaux d'Agriculture Anglais.* Par. M. le Comte Conrad de Gourcy. Paris: 1849.

author, affords some useful information as to the state of cultivation in that country.

In reply to the question—How much capital does a Flemish farmer require to cultivate successfully? M. Vanderplanke replies —A farmer, in order to cultivate with success, must possess 1000 francs for each hectare, that he may provide himself with a proper assortment of cattle, buy such manures as he can profitably employ, carry on useful works, to do everything in its season, and not be compelled to sell his crops at an unfavourable time. He must likewise possess the means of making up any loss in cattle, or the disastrous consequences of a hail-storm, an inundation, &c., to which all farmers are too often exposed. I am of opinion, however, that many farmers do not expend so considerable a capital, and this is a reason why many farms are not so well cultivated as they might be. We often see individuals, who have sufficient capital for a farm of 20 hectares, rent one of 50, or even upwards; and as farms to let are not so numerous as those who want them, they are often obliged to take such a one as they can get. The beauty and good qualities of a farm may thus tempt a farmer to rent it, although it be too great for his capital. It happens, however, that an intelligent and active farmer may succeed in overcoming the difficulty, and at last prove prosperous, notwithstanding his imprudence in commencing.

We have no fixed rotation. We take into account the disposition and quality of the ground, and I think that it would be difficult, if not impossible, to observe an invariable rule. Let us take *colza* (rape) as an example. It frequently happens that we sow after it, in the first fortnight of March, a crop of carrots—or rather, after gathering the colza, turnips, and most frequently wheat and *escourgeon*, (early or winter barley;) and if the land be very light, rye comes after the colza—particularly if the land is not clean, for that affords time for cleaning it. Oats usually follow the carrots or turnips.

Clover is almost always followed by wheat, the latter by colza; the reason of this is, that the clover, favouring, on account of its remaining at least eighteen months on the ground, the increase of dog-grass, the land is often very dirty after wheat. The colza, by its vigorous growth and large leaves, suffocates a great deal of this troublesome weed, which, if necessary, may be entirely destroyed by a half-fallow, between the end of June and beginning of October, the time of gathering the colza and sowing the wheat. If the land suffer from too much humidity in winter, the colza cannot be planted, as it is more injured by that cause than most other plants.

The following are the rotations most followed; but, I repeat, they are far from being fixed.

		Another.	A Third.
1st Year	Flax and carrots	Flax	Oats
2d ...	Wheat	Clover	Flax and carrots
3d ...	Rye and turnips	Wheat	Wheat
4th ...	Oats	Colza	Winter barley and turnips
5th ...	Clover	Wheat, rye, or winter barley and then turnips or carrots	Beans
6th ...	Wheat	Oats	Wheat
7th ...	Colza (rape)	Clover	Rye and turnips
8th ...	Wheat or rye and turnips	Wheat, rape, then turnips	Oats
9th ...	Potatoes or beans		Clover

Count de Gourcy then gives an account of the modes of manuring and cultivating these crops, deriving his information from his intelligent correspondent, M. Vanderplanke. The latter praises highly the practice of crossing Belgian cows with Durham bulls; the cows resulting from this mixture of blood are greatly superior to their mothers.

1st. In the quantity, and even quality of the milk.

2d. They are not more difficult, in regard to the quality of their food; and with respect to the quantity consumed, the difference is rather in their favour.

3d. They are always in better condition, and their growth and fattening incomparably more rapid. The butchers allege that their flesh is lighter and not so fine as that of the *furnes-ambacht* kinds; but the practice of these gentry to depreciate what they buy is well known.

This work contains an account of several farms in the centre of France, to which the author paid a visit in 1848, which will be perused with interest by those who wish to become acquainted with the agriculture of these districts, in many respects so different from our own.

Characteristics of the Year 1849. By J. Towers, Member of the Royal Agricultural Society of England, London Horticultural Society, &c.—I recur to the subject which for some years has been brought under consideration in the pages of this Journal. In doing so, I propose to modify in a degree the arrangement; and, while not omitting any phenomenon which was either remarkable in itself, or appeared directly to influence the weather, I shall condense the simple meteorological observations, and register the instrumental details thrice in each month only. *Retrospectively*, it will be proper to remind the reader that the extraordinary weather which caused so much damage to the harvest of South Britain meliorated in November 1848, and altogether passed away by the middle of December; so that I was authorised to close the article at p. 716 of last volume, with the hope that we might "anticipate a *seasonable* year, propitious to the land," &c.; and that hope will, I trust, appear to have been amply realised.

January.—The year commenced with a high barometer, (30 inch.

$1^{1}_{0}{}^{1}_{0}$,) lively E. wind, and tendency to frost. The first ten days were keen; the sharpest frost (24° and 25° Fah.) on the 2d and 3d mornings. A little snow fell on the 4th and 5th. The prevailing winds were easterly. Average, or mean of my barometer during the period, 29 in. 70 cts. Of the thermometer, corrected by two and three instruments—lowest or night reading off, 31°·2—maximum of the days, 36°·3—mean average, 33·75. There were four bright and fine days, the rest were cloudy; but the quantity of rain, or sleet, excepting on the 8th day, was trivial.

Second period of 10 days. Change of wind from W.N.W. to S.W. Temperature much milder, and the air balmy. There were seven fine, and three cloudy days, with only a few passing showers. The mean of barometric registers proved to be 29 in. 87 cents, being a slight advance. My thermometers gave—minimum average, 40°·6; maximum, per day, 47°·4: mean of both, 44°·4. Thus it appeared that a mild winter was pretty well confirmed. The *third period* comprised eleven days; the wind became more northerly by west, to the 26th; the temperature fell, and remained low to the end of the month, with occasional hints of frost and sleet. The barometric average was 29 in. 46 cts.; the thermometer marked 39°·6—45°·8—mean, 42°7. The averages of the entire month stand registered as, minimum, 37°·4—highest, 43°·26—at 10 P.M., 40°·15. Hence the month was mild. In it I find fourteen dry, and occasionally sunny days, and seventeen overcast, with a short or low supply of rain, and very little of snow.

February.—On the 29th ult. commenced that phenomenon of a most extraordinary elevation of the barometric column, which witnessed no decline of any consequence till the 19th evening; the greatest altitude was attained on the 11th and 12th=30 in. 76 to 80 cents; the average of the 21 days being 30 in. 40 cents. The atmosphere was dark and cloudy during the first week. It then became much clearer, and frequently bright; and remained so, till the 18th; thence it resumed, in the main, its previous character. The prevailing winds were westerly, generally quiet, or little disturbed; on the 28th, however, the current from S.W. was forcible; and rain in profusion, with snow and sleet, closed the month. The barometer began to fall on the 19th, and its average, to the 28th inclusive, was reduced to 29 in. 73 cents.

The thermometer averages of three periods—namely, 1st—9 days—were, lowest 39°.8, highest 45°·80; (2d.) 9 days—19th, lowest 34°·7, highest 48°·75; (3d.) to the end, lowest 39°, highest 47°·25: average of the month about 42½°. The frost on the 13th and 27th, at sunrise, never with me exceeded 2°, (Fah. 30°.)

Rain was almost absent, excepting on the 20th and 28th. Sixteen of the days were dry, but only seven decidedly sunny. On the 12th, 13th, 15th, 17th, and 23d, I noted, by means of a capital

achromatic telescope and a black eye-glass, many spots (*maculæ*) on the sun's disc, varying in number from perhaps two to eight or nine; and, in size, from the merest speck to a very large, irregular blot. The opinion formerly prevailed that these solar spots were coincident with cold, rainy weather: the warmth and drought of February 1849 lead to an opposite conclusion. It was most gratifying to observe the excellent and promising condition of the wheat—always healthy—slowly and regularly progressing, but by no means winter-proud. Beans and barley were beautiful, and such clover as I could observe healthy, and forming a close covering. Insect ravages, it appeared to me, had been everywhere slight.

March.—The criterion month of spring and summer commenced with a fine day, dawn just frosty, heat increasing to 47°, with sun clear soon after noon, and a lively westerly air, that quickly removed the snow; the evening was fine, calm, and bright; temperature 40°. One spot on the sun's disc.

In the first period of ten days, the wind blew generally from some westerly point, rarely brisk, never forcible. Six of the days were dry, with a fair average of sun. There was rime on the herbage in the early mornings of the 6th, and sharp wind, with a little snow, on the 9th. The keenest frost then also was felt; it marked 28° Fah. The average temperature of the ten nights was 36°·9; the highest by day, 49°·2. Barometric mean $30^{\text{in.}}\cdot16^{\text{cts.}}$ The chief phenomena were the solar spots seen at every observation, and a most gorgeous sunset on the sixth afternoon—golden, with beautiful green intermediate stripes. These tintings usually indicate rain, but none occurred on the present occasion.

The second series of ten days formed the cloudy period of March, yet not a drop of rain fell in this locality. The *vernal equinox* occurred on the 20th at 5^{h} 13^{m} in the afternoon. The day was fine, air keen, wind easterly, veering in the evening to N. by W.; barometer rising from $30^{\text{in.}}\cdot09^{\text{cts.}}$ to $30^{\text{in.}}\cdot22^{\text{cts.}}$ Thus the prognostic was favourable, and *indicated a dry quarter.* The westerly breezes continued till the 19th always mild and balmy, as will appear by the thermometric averages—viz., lowest, 39°·1, day maximum, 50°.8: mean of the two, 45°. The barometer ranged between $30^{\text{in.}}$ and $30\cdot30^{\text{cts.}}$; mean of all the notations, $30^{\text{in.}}\cdot20^{\text{cts.}}$ Fog and haze occurred twice—that is, on the 18th and 19th, preceding the change of wind to the E.

The third period comprised eleven days. The equinox appeared to have induced some fluctuations; for the wind not only had veered to an opposite point, at the very hour, so to say, of the circular intersections, but went back again by N.W. to S.W., where it continued throughout the 21st day. It then shifted to the E., then to N.E., E., and S.E., between the 21st and the 30th. The force was lively, on the whole, and produced the dark, cold

season of the month. Snow, in small quantity, fell on the 24th and 25th; small rain and a few showers in the last four days. The total rain of the month was extremely small—less than has been recorded for months. The averages were, lowest temperature, 36°·1, highest, 45°·16; mean of the entire month, 42°·8. Mean of the barometer, (the mercury falling rapidly after the 22d day,) 28in.·74cts.. We reckon twenty days entirely dry, the remaining nine being productive of very little falling weather. Thus the leading meteorological phenomena stand in complete opposition to those of 1848! The observations I was able to make were satisfactory: they proved the steady, but gradual, advance of all the crops then in the ground. Everything was healthy, nothing precocious.

April.—Proved to be the most trying and unpropitious month of the spring, at least in the S.E. counties. The wind during the first third was chiefly S., S. by W. and E., on the 6th, 9th, and 10th. The barometer barely maintained the altitude with which it commenced—29 in. 50 cents—(marked *changeable*,) and rain fell on eight of the days. I noticed a number of small spots on the sun on the 1st, 6th, 7th, and 8th. The averages of temperature were—minimum, 41°·1; maximum, 53°·8: mean, 47°·45.

Second period of ten days.—Wind fluctuating half the time, but at intervals easterly; the other half S.W. and N.W., lively. The barometer very unsettled, between 29 in. 77 cts. and 29 in 20 cts., averaging about 29 in. 55 cts. Rain, or some falling weather, on every day, excepting the 16th. On the 17th, evening, a scud of snow in immense flakes occurred—it was immediately followed by the sharpest frost of the season, and a brilliant sky. The morning dawned fine, with 3° *of frost* with me; the quotation at Chiswick and elsewhere *was many degrees lower.* Snow fell, with sleet, from recurring heavy masses of clouds. Much more snow fell on the 19th, and to an enormous depth on the Surrey hills, where the drifts—10, 12, and 14 feet deep—remained visible for many days. This severe visitation destroyed nearly all the gooseberries, many of the currants, and, partially, the wall-fruits, plums and pears. The last were expanding their bloom: it was interesting to observe the effects thereon, so soon as the sun had entirely thawed the frozen snow. Many solar spots were seen on the 20th. Thermometric observations gave 35°·3 as the lowest, or night average; 44°·7 the maximum by day; and 40° as the mean.

The *third period.*—21st to 30th day inclusive, produced some improvement: the winds were almost entirely W., or W. by S.,—variable in force, but genial. Six of the days free from rain, though with a paucity of sun. On the 29th, the barometer began to recover from its changeable position, after thunder-showers on the 28th afternoon. Its average of these ten days may be estimated at about 29 in. 89 cents. It rose, on the 30th night, to

30 in. 23 cents; wind at E. The temperature of the ten last days, and also of the total mean average, I quote at 45°·4.

May.—Was, upon the whole, a fine month, though its character proved fickle and variable: thus, in the first period, seven of the days were dry, and three only were sunny; the rest were cloudy, with a few trifling showers on four occasions. The wind was E. upon the whole; it varied to N. on the 10th, and continued W. chiefly by S. till the 21st. The temperature gradually increased, and was very high between the 2d and 6th—70° by day—but receded rapidly to an average of about 52° in the following week. The thermometer indicated, at the three usual observations, a mean of 45°·5 lowest, 61°·6 highest; averaging 53½°. The barometric mean of two daily readings, a trifle under 30 inches.

Second period, from the 11th to 20th, both included.—Here the S.W. winds were concurrent with the darkest and most ungenial weather of the month. A gleam might break forth; but my diary mentions only one sunny interval—about 2 o'clock P.M. of the 19th. There were two days without rain, but all the others showery—the 20th, profusely wet. The averages of temperature, lowest by night, 48°·3; day maximum, 59°·5; mean, 54°.

Third period, 11 days.—On the 21st, a N.E. gentle air brought improvement, with an increase of temperature of 12° by day. The wind, however, fluctuated by W., N.W., S., and so on, through every point, yet still with more genial weather and temperature. Heavy thunder-clouds became another concomitant of the existing mutations, and a few showers of mild spring rain fell before and after the day of the new moon, (22d, at 7 h. 37 m. A.M.) On the 28th, (moon's first quarter,) we had thunder in the early morning, and profuse rain for hours. Otherwise, the 8 remaining days of the 11 were dry, with a fair proportion of sun.

The average or mean temperature of the period was 60°, the lowest being 53°·25: maximum, 68°·73.

The mean of the entire month, 56°, less the merest fraction.

I made about fourteen solar observations, at different hours, and never but in two (12th and 13th) failed to detect spots, whose course could occasionally be traced from day to day, though always with a certain change of apparent position, according to the hour before or after noon when the observation was taken.

The oak and ash tree presented no aspects upon which to base any attempt at a prognostic, and, at the best, it may be prudent to offer no hints on the subject. In agricultural crops, progress was certainly observable; but the check given by the stern visitation of April had been of so positive a character, that a serious retardation became perceptible. We shall very shortly have more to say on that subject.

June.—The sixth or solsticial month, by the sanction of custom, is in the greater part of its course viewed as a spring month; and

yet, so soon as the sun has attained its greatest meridional altitude, we conventionally pass over six weeks, and style the period *midsummer.* This is an error agriculturally; though we are ready to admit, that the intersection of the two great circles, at the equinoxes and at the two solstices, may indicate the precise limits of the astronomical quarters.

June came in with splendour, but it proved extremely critical in its course, and most particularly justified its division into three periods.

First period.—The heat was great till the 6th; the 5th forenoon peculiarly oppressive, with 79° to 80° of heat, and a smoky atmosphere; thunder was heard at intervals; wind, electrical and fluctuating. A few drops of rain fell here, and a copious shower on the 6th; the temperature declined, with the wind at N.E., and was at 59° only on the tenth day. The mean averages were 53°·1 by night, 71°·1 by day: barometric mean altitude 30 in., 04 cts. *Wheat*, first ear seen on the eighth day; so far, notwithstanding the great check received in April, there was promise of an early harvest.

Second period.—Six days of uninterrupted E. winds; on the 16th evening the current changed to N.W., then moved by N.E, and settled in the W. and S.W., sometimes becoming lively. Two showers fell at Croydon on the 17th; one on the 19th; all the other days were dry, with cold air, and paucity of sun,—many of them quite cloudy. At this critical period, the crops were checked, and wheat just protruding, its blossom made little progress; the meadow hay would not make well, and the first cut of clover remained long in swath. Days attained their greatest length, but the cold biting air, and the want of direct and clear sunshine, threw back all the crops of the farm. In the hilly district of Surrey, to the east of the Brighton and Godstone roads, I noticed the condition of the plant, and there, in many parts of that locality, I again saw wheat still far from ripe at the end of August.

The barometer averaged 30 in. 09 cts; the thermometer 47.°2 and 66°·1=mean 56½°.

Third period.—Wind generally W. by N. or S., rarely brisk. The day of the new moon preceded that of the *summer solstice*, (21st,) which was very clear, sunny, and warm. So were also six of the days. A few drops of rain fell on the 25th; and the month closed with a little more in the night. Finer weather could not be desired; everything excepting turnips (swedes) advanced, but the ground was too dry for that valuable plant. The meadow hay, in vast abundance, was carried in safety; though, as usual, the farmers in some instances had ricked it too soon, and saw it injured by over-heating.

The instrumental observations gave, for the barometer, 30 in., for the thermometer, lowest 55°, highest 73°—net averages: total mean 64°, and of the entire month 60°.9.

July.—Is described under two heads only, and for the following reasons. The *first half* was decidedly dry, and generally sunny, excepting on the 3d, 4th, and 5th days. W. and S.W. winds, rather lively in force, prevailed till the 8th, when the current became easterly. On the 16th, at the middle of the month, a decided meteorological change took place: the barometer fell from its great altitude, the usual S.W. currents set in, and brought with them the moist soft weather, that we generally expect in July. During this period of 15½ days the temperature was remarkably equable, the average of all the nights being within a very trifling fraction 56°, maximum 77°, mean 66¼°. The barometer marked as its mean, 30in 09cts; and it would have been much higher, had not the column declined somewhat below 30 inches between the 2d and 5th days. The *second half*, commencing at mid-day of July 16th, constituted the showery period of the summer: the mercury fell 14 cents, and on the 17th fell to 29in 75cents; rain came, as gentle showers, on the 17th and 18th, and with thunder on the 19th and 20th. Two fine days succeeded, followed by four others with copious showers, occasional thunder, and a scud of hail on the 25th. Sun broke out on the 28th, and thence—though with intervening showers—the weather improved. I have thus been a little more particular and minute, because July is the only month of the year when we usually look for periodical rains.

The average of the barometer was reduced to 29in. 85cts.; the thermometer marked lowest mean 52°·6, highest 66°·6, which was one-tenth only above the mean of the first period. This great reduction of heat, with the absence of direct sun, confirmed the check which had been previously given in April and June. If the commencement of July had been moderately showery, and the latter half warm, the crops, and particularly the bulbs, would have recovered and advanced. As it was, it began to be seen that the latter could not be depended on; and that the coming harvest must be far, in point of time—nearly a fortnight—later than that of 1848. By the best weather table I possess, it appears that the amount of rain actually gauged in July, was two and one-tenth inches, being just one-tenth more than that of July 1848. While on the subject of rain, it will not be out of place to observe that the following month afforded a very singular contrast, and demonstrated the extraordinary uncertainty of our meteorology; for, in August 1848, the rain fallen is registered at four three-tenth inches, whereas that of 1849 amounted only to five-tenths of an inch.

August.—In one sentence, may be set down as among the finest months upon record—that is, in our part of Britain; for we ought always to bear in mind that localities, though not remote, differ materially in their meteorology. August, as I shall prove, though altogether superb as a summer, maturing month, could not redeem lost time. It ought never to be forgotten by those

who notice causes and effects, that, notwithstanding the fineness of the weather, there was a prevalence of *smoky haze*—the frequent masses of clouds suddenly appearing as if they consisted of London smoke; gleams would break forth, and then, in a moment, the masses of smoky haze would be re-formed. At this time that condition of the air which was styled the *choleraic atmosphere*, became predominant; and certain it is that during six weeks, including many days of July, and the whole of August, persons who had no symptom of the prevailing maladies, felt languid and depressed to an unwonted degree. One of our first medical men told me that he did not believe there was a single person in the town or vicinity who could say that he was in perfect health! This condition of the air did not abate till the full moon of September.

In consequence of the epidemic visitation I must be a little more particular in noticing the atmospheric phenomena.

First period.—Eight of the days were dry. The 7th was sultry. Thunder on the 8th, with a little rain. 9th, combinations of massive clouds, with alternate gleams. The barometer averaged 29 in. 95 cents. The thermometer marked—minimum, 53°.7; maximum, 71°.8.

Second period, from 11th to 20th inclusive. The 11th evening thundery, with much lightning; 13th, fierce wind—sunny gleams, and frequent showers; 17th, dry thunder-storms; 19th, smoky haze among and above rocky clouds. The barometer, at an average of the period, from two daily readings, 29 in. 91 cents.; thermometric lowest, 54°.7—highest, 68°.9: herein we had six days wherein a little rain fell—prevailing wind, S.W.

Third period was very much finer—a mere hint of rain fell on the 28th only. Still, gloom prevailed, though four of the days enjoyed partial gleams of sun. Smoky clouds still obscured the heavens, particularly on the 23d, 26th, 29th, and 30th, which last day was oppressive and gloomy. The atmosphere was quiet—wind generally came from some W. point—always more or less depressing to the feelings. The barometer rose to the average of 30 in. 0·7 cents. The temperature increased—minimum being 58° maximum 71°.27—average mean of the entire month I quote at 63°.06.

Wheat was cut on the earliest farm on the 6th—much was reaped by the 14th.

September.—Profuse rain early on the 1st day—lightning in the evening. Heat very great (75°) on the 2d and 3d, with lightning again in the evenings—some distant thunders and rain in the night. These electric commotions appear to have signaled, if the expression be permitted, the approaching departure of cholera. The sense of oppressive ennui and want of energy was distressing —but it appeared to give way with the lively eastern breezes that

sprang up on the 5th. The prevailing wind, to the 9th inclusive, had been E., but then the current changed to the S.W. The barometric average was 29 in. 91 cents. The thermometers had marked, lowest by the nights, 56°—highest by the days, 71°.6.

Wheat harvest was at this time nearly completed; but more or less of corn of all kinds remained in the cold, hilly districts. Turnips were widely patchy, and still backward for want of rain.

Second period, 11th to 20th inclusive. Weather, though dry after some showers on the three first days, was gloomy, with few sunny gleams. The wind was either W. by S. or by N., yet N.E. on the 17th and 20th. The barometer was frequently above 30 in. 10 cents; yet the average (on account of great depression between the 10th and 13th, when the rise became most rapid) marked only 29 in. 97 cents. The thermometer fell to 49° as the lowest average, and to 62°, or about 55° mean.

Third period.—Rain early on the 21st. The weather and temperature improved much on the eve of the autumnal equinox, when the sun entered Libra, at three minutes after 4 o'clock of the 23d morning. I made the following note in my diary, which may or may not be worthy of observation.—"Equinoctial prognostic—wet and mild, were it not that the wind is E. by N.—the glass falling—small rain for many hours—double strata of clouds—martins are numerous and loud." The wind was variable by S. of E. on the 24th. It then returned to E. by N.—became E. on the 27th, when the dry weather departed, with cirrus and cirro-stratus clouds in the evening. S. and S.W. wind with rain, came on, and thus the month closed. The averages with me were—barometer, 29 in. 86 cents—entire monthly mean, 29 in. 90 cents; thermometer, 52° and 64½°—mean, 58¼°. My diary notes twelve days or nights wherein some rain fell; and the rain estimated to have fallen at Greenwich was 3 3/10 inches—that of 1848 having been only 2 4/10 inches. On the whole, September, though fine, was greatly inferior in splendour to the corresponding month of 1848; yet, as the bulbous roots required moisture and warmth, the weather of the last period was favourable to their autumnal growth.

October.—This month divides itself, by its meteorology, into two periods only, as, with few and temporary exceptions, the wind blew from an E. or N. quarter till the 16th, with a predominance of wet weather; four only of the days being free from rain, of which three enjoyed the sun. The rain on the 3d, with almost a tempest of wind, was so violent as to frustrate every attempt to carry on our celebrated nuisance called the October "*Walnut fair.*" This opens on the 2d for sheep, cows, and horses; of the former about sixteen thousands might be penned—the best ewes fetched 35s. per head, lambs 25s., inferior from 18s. to 25s.; many were taken back unsold. *Turnips improved* much about this time; and it was most gratifying to notice the bulky yield of fine clover which, for weeks

previous, had been sold in bundles for green fodder. Farmers *will* grumble, but the corn-dealers all avouch the bulk and excellence of the late harvest. The average temperature of the first ten days —by night 45°.3—by day only 54°.7; that of the barometer, 29 in. 5 cents.

Second natural period from 16th to the end. Barometer began to rise on the 14th day, and remained a few cents above 30 in. for two days; it then declined, and fluctuated throughout the remainder of the month. The wind had become S.W. on the 17th, and deviated little from that quarter. Hence, as might be expected, there were alternations of fine and rainy weather. I enumerate nine days that were more or less rainy, and seven showery, pretty equally interspersed. On the 16th the suspended thermometers here marked 35° or 36° F., but the herbage proved that the temperature had been lower about dawn.

The averages were found to be 49°.7 min., 60°.6 maximum—mean of the last sixteen days, 55°. The barometer stood at about 30 inches. *Solar spots* were always discerned whenever a fair observation was taken. The month ended finely after a hazy morning, though with somewhat lower temperature.

November.—The time of year, and its usual character considered, proved one of the finest months of the year.

First period to the 11th. The barometer, with a trifling fluctuation, rising from 29 in. 48 cents to 30 in. 24 cents. The wind at first S.E. changing on the 4th to S.W., where it remained fixed for many days. Nearly all were dry, and many very bright; two foggy mornings, and two days, wherein a trifle of rain fell, were the exceptions. The air throughout gentle or just lively.

The average of the barometric range was 29 in. 75 cents.

My thermometers gave by the night, 44°.6, highest by day, 54°.4 —mean, 49½°.

Second period.—At first, the weather was fine and sunny; but it soon became changeable, the wind remaining westerly. There were four sunny days, five wherein it rained, and as many that were overcast. A keen hoar-frost occurred in the morning of the 17th, and the temperature generally fell. The averages were—lowest 40°, maximum 49—mean 44°.7. The mean height of the barometer I estimate at 30 in. 11 cents.

Third period.—Wind E. by S. or N., on the 21st, 22d, and 26th. At some W. quarter chiefly, at other times generally calm, but frequently keen. On the 24th evening, wind N.W. above, the thermometer began to fall; 25th a wetting frosty fog now introduced actual frost, which became very sharp, particularly on the 28th, many thermometers noting 12° to 14° below the freezing point: mine were read off at 25° F. on the 28th, and 26° on the 29th early; but the wind had changed to the S. Clouds formed after a lovely day, and rain fell in quantity, with the full moon of

the 30th. Every morning, during the frost, had been densely foggy. The averages of temperature of the ten days were, by night 33½°—highest 37½°, mean 35½°. Barometer, 29 in. 80 cents.

December.—Came in with a fine and bracing day, wind N.W., which however veered by S. and settled in the S.W. It blew fresh for two days, bringing much rain. Alternations of fine foggy and very damp weather succeeded, with occasional morning frosts. The range of the barometer gave an average of 29 in. 73 cents. The three averages of the thermometer I note at—lowest, 35°.6., highest, 43°.7—mean, 39°.6.

Second period, from 10th to 20th inclusive.—The four first days were decidedly frosty in the mornings, and chilly throughout till the forenoon of the 14th, when a sudden and remarkable change occurred, the thermometer rising 18 or more degrees; at 10 P.M. mine stood at 52° ! Much rain fell, as it did also on several days occasionally. The S.W. wind became violent: on the 18th it changed to N.W., and brought in frost on the 20th morning, with a clearer sky. On the 19th the barometer rose from 29 in. 82 cents to 30 in. 22 cts., and its average for the ten days was 29 in. 91 cts. The range of the thermometer was 6°, *i.e.* from 39°.4 to 45°.4—mean, 42°.4. A more gloomy atmospheric condition has rarely been observed. My diary notices two of the days only wherein the sun was unobscured—the 17th and 20th.

Third period.—An extreme elevation of the barometer became the subject of interest. Between the 21st morning—then at 30 in. 39 cts.—and the evening of the 25th, it fluctuated between 39 in. 47 cts., 50 cts., 38 cts., and 40 cts. Yet the atmosphere by no means corresponded with those fine indications. On the 26th the fall of the mercury became very rapid from 39 in. 13 cts. to 29 in. 28 cts. The weather was very changeable. Snow fell, which thawed; drizzly rain on the 24th and 26th, when fog and frost succeeded. A considerable quantity of snow fell in the night of the 27th. The thermometer fell to 24° F. to 22° at night of the 28th, and to 19° on the morning of the 29th. The barometer began to rise rapidly, and at the close of the month stood at 30 in. 32 cts. ! Its average for the whole of this period stands with me at 30 in. 10 cts. The thermometric mean of the entire month, at the regular observations, I find to be—lowest, 34° 54 ct.; highest, 41°.3 by day.

Upon the whole, there has been a paucity of sun, the number of clear days being only seven; and, by telescopic observation, *maculæ* or solar spots were seen on the 24th, 27th, and 30th. Few opportunities occurred that were favourable. More or less rain fell in eleven of the days or nights; *snow* on four, chiefly before daybreak. The condition of all the crops about us was more encouraging so long as I could observe them. Nothing was gay, because a check occasionally occurred. Wheat was very low in

general, and, as snow had covered the ground for several days, it became impossible to attempt any inspection. We hear of deep floods on the Essex and Suffolk coasts.

Notes on American Agriculture.—The great difference between British and American farming is this—that, while in the former small farms, in the majority of instances, can only be obtained, such is their abundance and cheapness in the latter country that even the small capitalist can easily obtain large tracts of land. This state of matters, viewed in a superficial way, would lead the inquirer naturally to suppose that to the American farmer it would prove a benefit; but that it is the reverse, a cause of much loss of money and waste of land and time, the experience of past years has fully proved. Scientific educated farmers of America complain that parties get possession of large tracts of land, and, while trusting to its extent and the natural richness of soil, they impoverish the land by over-working, without corresponding efforts to improve it; not being able to perceive the benefit of thoroughly cultivating one small portion, they waste their energies by farming in a slovenly way hundreds, it may be, of acres. The result is, that the great majority of the small farmers in the older states, are struggling to make both ends meet at the year's end, upon poor land, made poorer every year by the same exertion, which, if rightly applied, would make two stalks of corn grow where only one grew before. That this system, or rather want of system, has a remarkable influence in the aggregate production of wheat and other grains in the United States, is proved by the fact that the average produce of such in England is double that of the United States—in the former about 28 or 30 bushels, in the latter about 14 or 15—showing, what *we* have found out by experience, that superior cultivation on an old soil is an overmatch for the natural resources of "virgin land" or good soil, with slight or careless tillage. This maxim is gaining ground by slow but sure steps in the States; agriculturists are beginning to see that it is better diligently to cultivate one acre, and of course profitably, than spend fruitless and ill-directed exertions on a hundred. Men who were formerly the veriest slaves to industry, getting up early and lying down late, eating anything but the bread of idleness, are beginning to sell portions of their large farms, and are studying agriculture as a science, not, as formerly, a mere haphazard undertaking. Manure, formerly wasted, is now carefully kept and skilfully applied; draining is carried into effect thoroughly; and all the improvements made in this country are eagerly sought after by the educated farmers. The result of this new spirit has been exemplified in a striking degree during the last twenty years. Since that period, a spirit of enterprise and degree of improvement has been manifested by the farming interest. The actual products

of the soil in the old states, north and east of Washington, have probably been doubled; and so has also, in some of the states, the aggregate value of land. The old states in the south have been applying their energies in earnest to the renovation of their impoverished lands.

We have before us a list of agricultural papers published in the States, from which it appears, that, in the state of New York alone, there are seven published—six of them monthly, at an average price of 75 cents, or 3s. English, per annum; the remaining one is weekly at two dollars (8s.) a-year. Including these, there are altogether twenty-five in the United States. Agricultural societies are also very numerous, and the cause of exciting that spirit of emulation, so productive of good results, among the members. Twenty years ago it was difficult to find in the whole States a *book*-farmer, who studied books in his art and business—he ploughed, and sowed, and reaped, just as his fathers had done before him. Now it is different; many farmers are well read on the subject of agriculture, are alive to the importance of "thorough cultivation," and of the folly and slavery of cultivating too much land. The belief is gaining ground, that, for a farmer who is dependent upon his own exertions, a farm of twenty-five acres is sufficient for profitable farming, more that this will keep him poor, *less* will generally be more profitable—and this, whether he intends to raise potatoes in Maine, make maple sugar and keep sheep in Vermont, raise hemp in Missouri, sugar-cane in Louisiana, cotton in Alabama, tropical fruits in Florida, or various grains and fruits in the middle states, the same principle will hold good. As proof of the more generally spread opinions giving way to better, we give the following anecdote:—"A farmer who lives in the neighbourhood of Washington has contrived to get rich upon six or eight acres of land. A gentleman, one day in conversation, advised him to send his boys off 'west.' No, not he—the west was *too big*. He was looking out for some suitable 'lots' of three or four acres each, as fast as they should be old enough." This man is one of large and capacious views, and with these to guide him he chooses for his sons, who are destined to a life of manual toil, three or four acres in preference to a large domain; and this, not from a calculation of dollars and cents, for his lots of three or four acres will cost as much, nay, more, than one thousand acres of land at government prices. We have given these remarks at some length, as, unless we had done so, our readers would not have obtained a clear idea of the state of matters in that country, or understood the arrangements which may hereafter be introduced. Moreover, this "new light" has another influence—that is, preventing the necessity of farmers of good attainments emigrating from this country—pushing "far west," where, from the absence of markets, they may get rich in produce, but make little money—this will be

obviated, by the chance of getting land improvable, and capable of being cultivated *profitably* by superior management, in the older states, near good markets, where good prices can be had for his produce. We never yet have known an instance where an old country farmer, taking with him all his improved plans from this country, but what—on a small farm or plot of ground in the neighbourhood of a Transatlantic city—made money, and that rapidly. We would advise any one—intending to emigrate to America, with the intention of cultivating the land—if a farmer, to endeavour to obtain good land near a city in the older states; and to set about its cultivation with the same energy, and adopting all the improvements he would bring to bear in a similar case here; and not to run away with the foolish notion, prevalent to too great a degree, that in America all that a man has to do, in farming, is to *scratch* (such is the hackneyed phrase used) the land, throw in the seed and all will be well. In rich virgin soil this may, and does produce a crop; but, if so much can be got by such slovenly means what may not be expected when scientific and rational modes of operating are universally adopted?

We here give a table, showing production in the crops, from the year 1841 to 1845—thus bringing down to nearly our own period the information of use to our agriculturists. It is good policy for our farmers to look about them, and use every effort to make the most of their land. The Americans are going ahead in this, as in every other department; and their industry is too proverbial to let them remain long or far behind other nations.

Aggregate Summary of the Estimates of the principal Crops throughout the United States, 1840 to 1845.

Product		1841.	1842.	1843.	1844.
Wheat —	bushels	91,642,957	102,317,340	100,310,856	95,607,000
Indian corn,	do.	387,380,185	441,829,246	494,618,306	421,953,000
Potatoes,	do.	113,183,619	135,883,381	105,756,133	99,493,000
Barley,	do.	5,024,731	3,871,622	3,220,921	3,627,000
Oats,	do.	130,607,625	150,883,617	145,929,966	172,247,000
Rye,	do.	19,333,474	22,762,952	24,280,271	26,450,000
Buckwheat,	do.	7,953,544	9,483,409	7,959,410	9,071,000
Hay,	tons	12,504,705	14,053,358	15,419,807	17,715,000
Tobacco,	lb.	240,187,118	194,694,891	185,731,554	151,706,000
Cotton,	lb.	578,008,473	683,333,231	747,660,090	872,107,000
Rice,	lb.	88,952,968	94,017,484	89,879,145	111,759,000
Silk,	lb.	379,272	244,124	315,965	396,790
Sugar,	lb.	126,164,644	142,445,199	106,400,310	201,107,000

Reserving our remarks on these facts, we will first give a Table of the estimate of all the crops—namely, wheat, Indian corn potatoes, rye, barley, oats, buckwheat, hay, tobacco, cotton, rice silk, and sugar, in 1845, showing the produce of the different States; and then give a statement of their average value.

I.—TABLE OF CROPS.

States.	Wheat.	Indian Corn.	Potatoes.	Rye.	Barley.	Oats.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
Maine, . .	502,000	1,912,000	8,613,000	185,000	273,000	1,564,000
New Hampshire,	647,000	1,828,000	3,714,000	425,000	123,000	1,942,000
Massachusetts, .	241,000	3,098,000	3,028,000	594,000	162,000	1,856,000
Rhode Island, .	5,000	731,000	650,000	47,000	51,000	200,000
Connecticut, .	114,000	2,649,000	1,694,000	1,010,000	26,000	1,646,000
Vermont, .	854,000	1,728,000	4,926,000	321,000	51,000	3,593,000
New York, .	16,200,000	13,250,000	21,986,000	3,560,000	3,574,000	23,700,000
New Jersey, .	1,050,000	7,314,000	1,757,000	2,954,000	8,500	4,912,000
Pennsylvania, .	12,580,000	17,126,000	5,497,000	11,929,000	141,000	19,826,000
Delaware, .	440,000	2,713,000	155,000	53,000	4,500	828,000
Maryland, .	4,884,000	3,723,000	705,000	944,000	2,700	1,691,000
Virginia, .	11,885,000	27,272,000	1,899,000	1,441,000	84,600	8,888,000
N. Carolina, .	1,969,000	14,887,000	2,711,000	217,000	3,600	2,673,000
S. Carolina, .	1,168,000	8,184,000	2,520,000	48,000	3,600	700,000
Georgia, .	1,571,000	13,320,000	1,536,000	64,000	11,800	833,000
Alabama, .	980,000	16,650,000	1,635,000	76,000	7,200	1,527,000
Mississippi, .	378,000	2,167,000	3,040,000	21,000	1,800	1,189,000
Louisiana, .	—	8,360,000	1,299,000	2,000	—	—
Tennessee, .	8,340,000	70,265,000	2,256,000	384,000	5,500	8,625,000
Kentucky, .	4,769,000	54,625,000	1,508,000	2,548,000	15,400	13,091,000
Ohio, . .	13,572,000	57,600,000	4,120,000	798,000	219,600	24,447,000
Indiana, .	7,044,000	30,625,000	2,680,000	221,000	35,200	13,902,000
Illinois, .	4,563,000	25,584,000	2,631,000	143,000	101,200	12,597,000
Mobile, .	1,525,000	15,625,000	875,000	81,000	11,000	5,466,000
Arkansas, .	2,427,000	8,250,000	642,000	12,000	900	436,000
Michigan, .	7,061,000	4,945,000	4,555,000	77,000	197,200	4,815,000
Florida, .	—	733,000	255,000	—	—	8,000
Wisconsin, .	971,000	672,000	938,000	5,000	20,000	1,200,000
Iowa, . .	793,000	2,028,000	516,000	8,000	25,000	681,000
Columbia, .	15,000	35,000	41,000	7,000	—	12,000
	106,548,000	417,899,000	88,392,000	27,175,000	5,160,000	163,208,000

I.—TABLE OF CROPS.—(*Continued.*)

STATES.	Buck Wheat.	Hay.	Tobacco.	Cotton.	Rice.	Silk Cocoons.	Sugar.
	Bushels.	Tons.	lb.	lb.	lb.	lb.	lb.
ıe, . .	69,000	1,877,000	—	—	—	944	300,000
Hampshire,	154,000	526,000	—	—	—	1,210	2,200,000
achusetts, .	126,000	530,000	123,000	—	—	47,110	500,000
le Island, .	4,000	46,000	—	—	—	1,250	—
ıecticut, .	444,000	458,000	794,000	—	—	220,000	50,000
ıont, .	300,000	1,139,000	—	—	—	13,740	10,000,000
York, .	3,347,000	3,703,000	—	—	—	7,850	14,500,000
Jersey, .	900,000	282,000	—	—	—	6,240	—
ısylvania, .	3,332,600	1,527,000	535,000	—	—	41,370	1,600,000
ware, .	13,000	19,000	—	—	—	5,500	—
land, .	109,000	56,000	17,920,000	6,000	—	10,240	—
inia, .	—	296,000	30,218,000	2,412,000	2,500	9,260	1,700,000
arolina, .	—	67,000	10,373,000	40,000,000	3,000,000	8,850	9,000
ırolina, .	—	16,000	40,000	45,000,000	66,500,000	7,620	30,000
gia, .	—	13,000	195,000	205,000,000	14,500,000	8,430	350,000
ama, .	—	15,000	341,000	145,000,000	280,000	7,890	12,000
ssippi, .	—	1,000	193,600	235,000,000	975,000	300	—
ıiana, .	—	26,000	—	185,000,000	3,800,000	1,570	175,000,000
essee, .	26,000	42,000	37,109,000	48,000,000	9,000	30,110	520,000
ucky, .	14,000	123,000	63,310,000	1,200,000	17,000	6,970	2,100,000
, . .	950,000	1,251,000	7,576,800	—	—	39,370	3,900,000
ına, .	73,000	1,351,000	3,520,000	—	—	1,150	8,000,000
is, . .	99,000	297,000	1,168,000	270,000	—	4,680	600,000
le, . .	19,000	77,000	13,744,000	200,000	—	290	450,000
nsas, .	—	1,000	—	17,000,000	6,500	300	5,000
igan, .	250,000	214,000	—	—	—	1,900	3,000,000
da, .	—	1,000	260,000	12,000,000	675,000	590	750,000
onsin, .	25,000	84,000	—	—	—	40	300,000
, . .	14,000	26,000	—	—	—	—	150,000
nbia, .	—	1,000	—	—	—	1,500	—
	10,268,000	14,065,000	187,422,000	936,088,000	89,765,000	486,530	226,026,000

II.—STATEMENT OF THEIR AVERAGE VALUE.

Wheat, . . .	106,548,000	bushels	at	50	cents,	equal to	53,274,000	dollars.
Indian corn, .	417,899,000	...	...	25	...	...	104,474,500	...
Potatoes, . . .	88,392,000	...	...	25	...	...	22,098,000	...
Rye, ...	27,175,000	...	...	35	...	...	9,511,250	...
Barley, . . .	5,160,600	...	...	35	...	...	1,806,000	...
Oats, . . .	163,208,000	...	...	28	...	...	45,698,240	...
Buckwheat, . .	10,268,000	...	...	25	...	...	2,567,000	...
Hay, ...	14,065,000	tons	...	10	dollars,	...	140,650,000	...
Hemp and flax,	37,500	...	...	70	...	...	2,625,000	...
Tobacco, . . .	187,422,000	lb.	...	7	cents,	...	13,119,540	...
Cotton, . . .	936,088,000	...	...	5	...	...	46,804,400	...
Rice, . . .	89,765,000	...	...	3	...	...	2,692,956	...
Sugar, . . .	226,020,000	...	...	5½	...	...	12,431,430	...
Silk cocoons, .	486,530	...	...	4	dollars,	...	1,946,120	...
					Aggregate value, ...		459,698,430	dollars.

or, reckoning 5 dollars to £1 British currency, somewhere about £92,000,000.

Referring to these tables and statement, we find in every branch a progressive increase—potatoes, barley, and tobacco being the only exceptions. Of human food, Indian corn is raised, as compared with wheat, in the ratio of 4 to 1, on account of the growing fondness of the people for it as an article of food, more than for exportation. Of states similar in size, population, latitude, and productions, the difference in the amount of certain productions is curious. Thus, Kentucky produces twice as much corn and tobacco as Virginia, and 8 to 1 of rice; while Virginia raises twice as much cotton as Kentucky, Vermont produces twice the quantity of hay as New Hampshire. The increase of cotton is most striking. In 1784, the first cotton was exported—about *three bags*, or 1200 lb.; and so lately as 1800, only 10,000 lb.: in 1845 it was nearly one hundred thousand times as much; and the increase could be doubled—so say the planters—in three years. The United States have no reason to complain of the profits on cotton, a committee of the House of Commons having reported, that, during the last twenty-five years, the enormous sum of £268,000,000 sterling has been paid them by this country for that article. But the cotton cultivation is confined to a few states, while that of sugar is more general. The first experiment in making sugar was tried in New Orleans in 1796. The exclamation, "It grains, it grains!" (referring to its crystallisation,) ran through the country, producing considerable excitement. Louisiana is the grea[illegible] growing state, and is capable of supplying the whole [illegible].832, its crop amount[illegible]o 70,000 hogsheads, which [illegible] 0,000,000 lb[illegible] .84[illegible] had increased to [illegible]1,50[illegible]

B.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Rye. s.	d.	Pease. s.	d.	Beans. s.	d.
1849.												
Dec. 1.	45	4	30	11	17	5	22	0	31	9	27	8
8.	45	0	28	7	17	8	25	1	33	1	28	10
15.	45	1	27	6	17	11	25	6	30	8	28	0
22.	42	1	27	3	17	2	26	0	30	9	27	5
29.	43	6	28	2	17	10	24	9	31	1	27	1
1850.												
Jan. 5.	44	0	26	8	17	9	24	10	29	0	26	4
12.	46	2	27	7	17	6	25	0	30	10	26	11
19.	46	4	26	2	17	10	21	0	27	11	27	10
26.	44	1	27	7	17	3	22	6	30	10	26	6

EDINBURGH.

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Pease. s.	d.	Beans. s.	d.
1849.										
Dec. 5.	55	6	21	2	16	2	26	0	26	4
12.	55	9	21	5	17	8	26	8	27	2
19.	55	11	21	1	17	1	26	6	27	2
26.	56	11	21	10	16	4	26	0	26	8
1850.										
Jan. 2.	58	6	21	7	16	6	25	6	26	4
9.	58	7	20	11	16	5	25	0	25	8
16.	57	2	21	4	16	10	25	8	26	9
23.	56	5	21	4	17	4	25	6	26	1
30.	56	7	21	3	16	10	25	6	25	11

LIVERPOOL.

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Rye. s.	d.	Pease. s.	d.	Beans. s.	d.
1849.												
Dec. 1	38	8	26	3	16	0	21	9	25	8	26	7
8.	38	1	27	10	15	10	23	10	24	9	27	1
15.	37	2	25	9	17	3	24	6	23	4	27	6
22.	38	10	25	3	16	3	25	6	28	3	26	6
29.	38	7	26	2	17	6	24	9	26	0	26	2
1850.												
Jan. 5.	41	2	26	11	17	8	24	0	27	4	28	0
12.	39	7	22	1	16	10	23	9	26	6	26	4
19.	39	11	25	10	17	0	22	4	29	2	32	0
26.	40	2	24	10	17	2	22	1	28	8	30	3

DUBLIN.

Date.	Wheat, p. barl. 20 st. s.	d.	Barley, p. barl. 16 st. s.	d.	Bere, p. barl. 17 st. s.	d.	Oats, p. barl. 14 st. s.	d.	Flour, p. barl. 9 st. s.	d.
1849.										
Dec. 7.	20	7	11	8	9	8	8	11	15	0
14	20	0	12	2	9	10	9	1	14	10
21.	20	6	12	8	10	0	9	4	14	9
28.	20	9	12	4	10	4	9	6	14	8
1850.										
Jan. 4.	21	0	12	6	10	6	9	6	14	10
11.	21	3	12	9	10	9	9	10	15	0
18.	21	6	12	11	11	0	10	1	15	1
25.	21	0	12	5	10	11	9	7	14	9
Feb. 1.	21	3	12	4	10	10	10	0	14	10

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average. s.	d.	Wheat. Aggregate Average. s.	d.	Barley. Weekly Average. s.	d.	Barley. Aggregate Average. s.	d.	Oats. Weekly Average. s.	d.	Oats. Aggregate Average. s.	d.	Rye. Weekly Average. s.	d.	Rye. Aggregate Average. s.	d.	Pease. Weekly Average. s.	d.	Pease. Aggregate Average. s.	d.	Beans. Weekly Average. s.	d.	Beans. Aggregate Average. s.	d.
1849.																								
Dec. 1. ...	40	2	40	9	28	1	28	5	16	4	16	10	24	1	23	5	30	2	30	7	28	6	29	4
8.	39	4	40	5	27	5	28	3	16	6	16	9	23	9	23	5	30	1	30	4	28	4	29	3
15. .	38	9	30	11	28	9	27	11	16	0	16	7	22	6	23	5	28	11	30	3	27	8	28	10
22. .	38	6	39	7	25	9	27	5	15	9	16	5	22	9	23	6	28	10	29	10	27	5	28	6
29. ..	39	4	39	5	26	9	27	0	15	6	16	2	24	0	23	6	29	0	29	7	26	11	28	1
1850.																								
Jan. 5. ...	40	0	39	4	25	11	26	7	15	10	16	0	24	11	23	8	28	5	30	8	26	10	27	8
12.	41	1	39	6	26	4	26	4	15	6	15	10	23	4	23	6	26	6	29	0	26	6	27	4
19. . .	41	0	39	10	26	8	26	1	16	0	15	9	23	0	23	6	27	6	28	9	26	6	27	0
26. .	40	1	40	0	25	9	25	11	15	10	16	9	21	2	23	4	28	5	28	5	26	1	26	9

FOREIGN MARKETS. Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1849-50.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Dec. ..	Danzig	35 0 - 39 6	13 6 - 18 6	10 0 - 14 0	15 0 - 19 0	16 6 - 20 0	21 0 - 25 0
Jan. ..	Danzig	36 0 - 42 0	13 6 - 17 6	9 6 - 13 6	14 6 - 18 0	17 0 - 20 6	20 0 - 24 0
Dec. ..	Hamburg	33 0 - 39 0	14 6 21 0	10 0 - 14 0	15 0 - 20 0	20 0 - 25 0	19 0 - 24 0
Jan. ..	Hamburg	39 6 - 39 6	14 0 - 19 9	9 6 - 13 9	14 6 - 19 6	20 0 - 24 0	18 6 - 23 0
Dec. ..	Bremen	34 6 - 39 6	14 6 - 18 6	10 0 - 14 6	15 0 - 19 0	21 6 - 26 6	20 0 - 26 6
Jan. ..	Bremen	33 6 - 38 9	13 6 - 17 6	9 6 - 13 0	14 6 - 18 6	20 0 - 25 0	19 0 - 24 0
Dec. ..	Königsberg	32 6 - 39 0	13 6 - 15 3	8 6 - 10 6	15 0 - 18 0	17 6 - 20 6	15 0 - 20 3
Jan. ..	Königsberg	34 0 - 41 0	13 0 - 15 6	8 6 - 11 0	14 9 - 18 0	17 0 - 20 0	16 0 - 20 6

Freights from the Baltic from 3s. 9d to 4s. 6d; and from the Mediterranean, from 6s. to 8s.

THE REVENUE.—From 5th January 1849 to 5th January 1850.

	Quarter ending Jan. 5. 1849.	Quarter ending Jan. 5. 1850.	Increase.	Decrease.	Year ending Jan. 5. 1849.	Year ending Jan. 5. 1850.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs....	4,682,395	4,720,630	38,235	..	18,920,360	18,695,798	..	233,562
Excise	3,253,162	3,625,061	371,899	..	12,832,140	12,753,815	..	78,325
Stamps....	1,472,598	1,509,860	37,262	..	6,110,848	6,365,475	254,627	..
Taxes ..	1,921,013	1,897,061	..	23,052	4,314,704	4,303,849	..	10,855
Post-Office..	198,000	152,000	..	46,000	776,000	806,000	30,000	..
Miscellaneous	51,708	118,408	66,699	..	182,166	409,242	227,076	..
Property Tax	424,434	449,394	24,960	..	5,347,365	5,408,159	60,794	..
Total Income	12,003,311	12,473,314	499,065	69,052	48,483,583	48,749,338	572,497	322,742
	Deduct Decrease ..		69,052		Deduct Decrease		322,742	
	Increase on the qr. ..		430,003		Increase on the year		249,755	

TABLES OF BUTCHER MEAT.—Per Stone of 14 Pounds.

Date.	London Beef.	London Mutton.	Liverpool Beef	Liverpool Mutton	Newcastle Beef	Newcastle Mutton.	Edinburgh Beef.	Edinburgh Mutton.	Glasgow Beef.	Glasgow Mutton.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d	s. d. s. d	s. d. s. d	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1849. Dec. ..	5 9 - 7 9	5 6 - 7 6	5 3 - 7 3	5 3 - 7 0	4 9 - 6 9	5 3 - 7 0	5 3 - 6 9	5 6 - 6 6	5 6 - 6 6	5 3 - 6 9
1850. Jan. ..	5 3 - 6 9	5 6 - 7 0	5 0 - 7 0	5 0 - 7 0	4 6 - 6 6	5 0 - 6 6	5 0 - 6 6	5 3 - 6 3	5 6 - 6 6	5 3 - 6 3

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

ENGLISH.	s. d. s. d.	SCOTCH.	s. d. s. d.
Merino,	11 6 to 17 0	Leicester Hogg,	9 6 to 15 0
.. in grease,	9 0 to 12 6	.. Ewe and Hogg,	8 6 to 11 6
South-Down,	12 6 to 17 0	Cheviot, white,	7 6 to 11 0
Half-Bred,	10 0 to 12 6	.. Laid, washed,	6 6 to 8 6
Leicester Hogg,	10 6 to 15 6	.. unwashed,	5 0 to 7 0
Ewe and Hogg,	9 0 to 12 0	Moor, white,	5 3 to 7 3
Locks,	6 0 to 7 6	.. Laid, washed,	4 3 to 5 6
Moor,	5 0 to 6 6	unwashed,	3 9 to 5 3

ON A METHOD OF OBTAINING CORRECT STATISTICS OF AGRICULTURAL PRODUCE.

In a Letter to the Right Hon. Henry Labouchere, M.P., President of the Board of Trade.

From Mr John Dudgeon, Spylaw, Kelso.

Sir,—The most important part of another session of Parliament has now nearly passed, and we are again left to regret that no steps have been taken to procure correct information on the important subject of agricultural statistics. For many years past, we have been induced to hope that something would have been accomplished in this direction. Hitherto, however, the matter having been left to the unassisted exertions of private members of Parliament, as was to be expected they have found themselves unequal to so difficult a task. It is to the strength and influence of Government alone that success is to be expected in a matter necessarily involving machinery somewhat wide in its ramifications, and authority and aid which the State only possesses. It is therefore to you, as the head of that department under whose province the matter more immediately falls, that I take the liberty to address the following suggestions on this essential subject; in the hope that, should they not be found directly applicable, they may at least be useful in affording some hints to assist in forwarding this great work. It cannot be that the difficulties of the subject should be thought so insurmountable as to deter this great nation from entering upon a task which others have performed with apparently some satisfaction; for I hope to be able to show, that, though the details may appear somewhat intricate, they are not so elaborate or difficult in execution as they may at first sight appear. That a full and correct knowledge of our agricultural statistics is a most desirable object, has been ever admitted; and it must be owned, that the deficiency of our information on this subject has, from the experience of the last few years, been most lamentably felt. I would have deemed it unnecessary here to allude to the meagreness of the sources of our information on this important matter, and the erroneous views into which our best and most careful statisticians have been led by the want of correct data upon which to form their calculations, but that I conceive it may better lead to a right knowledge of the nature of the information required, and of the machinery necessary for the purpose of collecting it, that I shortly notice some of the errors and discrepancies which have existed among our first authorities, and endeavour to show how, in some instances, as it appears to me, these mistakes have arisen. No doubt the vague and imperfect sources from which the most painstaking could obtain their information, permitted little more than an approximation to fact; and it would have been better, under the circumstances, that their conclusions had been

announced in a less decided tone. The Legislature, as I have just hinted, has alone been to blame that better materials did not exist; and it is unfortunate that anything like authentic information on the economy of this most important branch of industry, should hitherto have been left to be gleaned almost entirely from the praiseworthy exertions of private individuals who, however zealous and indefatigable in such researches, possessed not the gigantic appliances which a nation alone can command to the right performance of so extensive an enterprise.

It is not to be wondered at, therefore, that our highest authorities—having access to no superior information of a national kind, and being left, in many instances, to conjectural calculations—should have varied, in their estimates of the actual amount of our ordinary produce, as 5 to 7. Nor is it surprising such an egregious discrepancy should exist, seeing that the extent of land under crop, as given by our first statisticians, differs to the extent of a million and a half acres, or more than 16 per cent. In the "*distribution*," as it is called, of the arable land, there is clearly a most extraordinary error, which goes far to show the necessity there exists, that the "*returns*," in procuring information of this kind, should be made and prepared by persons conversant with agricultural subjects.

For example, Mr Comber *—whom all our other authorities of most note seem to follow—taking the total number of acres in England and Wales at 11,591,000, assumes nearly 7,000,000 acres to be annually under a grain crop, while 4,500,000 only are devoted to grass and fallow and green crops; thereby averring that two-thirds nearly of the whole surface must be annually under corn—a mode of management which, as no more than the extent of land set apart for the other division of crops remains fresh for grain in the next year, involves the necessity of 2,500,000 acres of the soil of England, or considerably more than a third of the whole land under grain in any one year, being subjected to the same species of crop in the succeeding season—a system, it is well known, totally inconsistent with every sound principle of husbandry, and which could not be pursued, for any length of time, with reference to the maintenance of the fertility of the soil.

I am aware, Sir, I do not require to point out to you in detail the erroneous calculations under which we at present rest as to the means of supply of food derived from our own soil; but I trust I may be excused, in my anxiety to give this communication at the same time a somewhat more popular form, from now taking a hasty glance of the whole subject of our grain produce relating to the United Empire; in order to show, however summarily, that, notwithstanding the assumption by former authorities of too large

* On *National Subsistence*, App. p. 52.

tion of surface in crop in each year, it is evident, from the d requirements of our population, that the estimate of our ırns of corn have been set down at very considerably too mount.

Mr M'Culloch *—assuming that 12,000,000 acres are the ınt of the arable land of England and Wales, *including grasses*, and falling into the error also that nearly two- the whole of this extent are annually under crop—gives

produce for this division of the Empire at	29,450,000	qrs.
l is calculated to yield	7,377,500	„
evidently much too high in proportion to England, set down as giving	20,450,000 †	„
produce of the United Kingdom, . .	57,277,500	„

s total there appear, as

. . . .	14,060,000	qrs.
. . . .	5,980,000	„
c. &c , ...	37,237,500	„
	57,277,500	„

erroneous nature of this estimate, in the aggregate, is ıpparent, when we apply to it the test afforded by the consumption of the country as generally reckoned.

taking the population at the time assumed (1841) at 00 for Great Britain, and 8,400,000 for Ireland, it may be umed, that of the former there are not fewer than 15,000,000 rs of wheaten bread. I reckon of this number about 00 for England; and to justify this amount, I quote Mr h's words, who says, "Wheat is now the all but universal rn of England." Ireland will give at least 2,000,000 to ıber; and taking Scotland at 1,000,000, we have a total

cal Account Brit. Emp., edit. 1837, vol. ii. 528. I am aware that, in the later his elaborate work, Mr M'Culloch has enlarged somewhat this estimate, sult derived from it. But it is well known this could not have been consequence of more authentic materials having been since acquired; and, ed, was so altered, as the amount of crop derived from such an area could hibit a large deficiency of produce in comparison with the amount of food nsumed by an increased population. I have retained, however, this esti- uite sufficient for the illustration I have taken in hand. And I think it that I should not come further down in this review than 1841, when the ount of the population was last ascertained, and in the years subse- which, the trade in corn has been more than usually unsteady and dis- reason of frequent and violent alterations in the law; and, above all, atter years, the importations of foreign grain have been so enormously by the alarming failure of an essential portion of the produce of our own

† Larcombe's *Report to Parl.*, dated 4th August last, this is only stated as qrs. in 1847; and as low as 12,282,408 qrs. in 1848. But there are here ıptions as to the general yield of the crop, and inconsistencies as to which too clearly expose its fallacies to a practical observer.

in the United Empire, as consumers of wheat, of 17,000,000. Applying, then, the usual and admitted calculation to this subject, this number cannot be held as consuming less than an equal number of quarters of wheat. But as this supposes an average consumption of rather more than two quartern loaves a-week to each individual, though a usual estimate, perhaps we may be nearer the truth to set apart about seven bushels of wheat only to each consumer, and thus to adopt 16,000,000 quarters as the annual consumption of these realms at this time, including what is used in the manufacture of starch, pastry, &c.

It may be fairly held that these eaters of bread are consumers of other varieties of grain, to the extent nearly of what would amount to one bushel each, annually, on the average; or, say equal to 2,000,000 quarters of oats and barley in equal proportions: while the remaining 11,000,000 persons—of whom we exclude 3,000,000, as being under an age to come into this average, giving 8,000,000 —I presume, upon the ordinary data of 1½ quarters each, consume 12,000,000 quarters of oats, and barley in the proportion of three-fourths of the former to one-fourth of the latter species of grain.

From the Parliamentary returns of the "quantities of malt charged with duty" in the United Empire, during the average of five years ending 1840, at which period the consumption in this way seemed rapidly on the increase, it appears that the amount of barley thus consumed is upwards of 5,200,000 quarters. These figures, it will be observed, when the quantity required for seed is included, embrace nearly every quarter that is said to be grown, leaving nothing to be consumed by men and cattle in any other form, and for the very considerable quantity converted into spirits in an unmalted state.

Then we have the large consumption of corn by horses. Of these, there are computed by the latest calculations to be not fewer than 1,600,000 in the United Empire, which, at the usual very low computation of 10 quarters of oats annually for each horse, gives a total of 16,000,000 quarters. The quantity of grain consumed by cows and feeding stock, cannot, perhaps, be taken at less than 5,000,000 of quarters.

Then, lastly, there falls to be deducted from our estimated annual produce the amount required for seed. This, calculated according to the extent of land above set down, underrated as we [illegible] for

	Qrs.
[illegible] .	1,640,000
Barley at [illegible] bushels, . .	574,000
[illegible] at 6 bushels .	5,680,000
[illegible] .	7,894,000

The whole matter, then, would stand thus:—

	Qrs.
Wheat as bread, &c.	16,000,000
Oats consumed by man, . . .	10,000,000
Barley eaten, ...	4,000,000
Barley malted, ...	5,200,000
Barley distilled unmalted, . .	1,200,000
Consumed by horses and cattle, . .	21,000,000
Seed, ...	7,900,000
	65,300,000

Thus, even on a moderate calculation of our consumption, we have the enormous discrepancy of upwards of 8,000,000 of quarters between the computed necessary wants of our population and the estimates of the produce of the empire by our best statisticians. We are thus, then, driven to the conclusion, that the difference lies in error of calculation; for it is notorious that, while the apparent deficiency of our native produce I have just pointed out, amounts to upwards of an eighth part of our calculated requirements, we have not upon an average of the whole years of the present century, up to 1841, *imported from abroad annually an amount much above a sixtieth part of the yearly average produce of our own soil!* *

But, as I have before said, this decrepancy is not surprising when we consider nothing has been attempted at any time, on such a scale as the necessity of the case demands, to acquire suitable information; while in point of fact we have few materials of any kind to afford the groundwork of our calculations later than 1812 and 1814; and circumstances, it is evident, must have changed very materially during the last thirty years to justify a much larger amount of produce than has yet been proposed.

Upon the whole, then, for the present purposes, I think it must be admitted we are almost entirely destitute of the means of ascertaining, with any precision, the amount of the annual produce of our grain crops.

In live stock also, and in the value of roots, grass, and dairy produce, we are alike without any detailed or accurate information. As regards cattle and sheep—two of the most essential elements of the proceeds of agricultural industry—we have no account of their numbers or value, further than has been conjectured from a comparison drawn from the amount required to feed the ascertained population of the metropolis, and some other of our large towns. Or the still more vague process, to arrive at an approximation, has been adopted—to make a rough average estimate of grass and roots, and, converting the amount into the value of the live stock

* The annual average importations of all kinds of grain and flour, from 1800 to 1840 inclusive, amount to 1,160,284 quarters. See Tables compiled from Parliamentary Returns; *Mundell's Indust. Sit. of Great Britain*, p. 52; *Tooke's Prices*, vol. iii., App. 293.

presumed to be maintained by such, thus to guess at the numbers of cattle and sheep reared and fed in the United Kingdom.

For instance, Mr M'Culloch gives the total head of cattle in Great Britain as 5,220,000;* the fourth part of which, or 1,305,000, he estimates to be annually slaughtered. Mr Youatt, again, in the introduction to his useful work on cattle, calculates the number annually consumed to amount to 1,600,000, which there is little doubt, I think, will be found nearer to the proportion annually slaughtered in relation to the numbers yearly fed and reared, (presuming the first estimate near the truth,) when we consider the many animals of the finer breeds which are now prepared for the shambles at two years old. But I doubt much the accuracy of Mr M'Culloch's first figures; and that there should be error, is not surprising; for the truth is—to our shame be it spoken—there appear no data, as regards England, from which to derive the foundation of this estimate, later than Arthur Young's tour in 1779!

As to what may be the *value* of the cattle annually disposed of by the agriculturist, the materials for any attempt at an estimate are still more vague. No wonder if, when our agricultural statistics shall be obtained in a manner somewhat after a right fashion, it shall be found we have erred far from the truth.

Nor is the matter less haphazard as respects the estimate of our sheep stock; for while Mr Youatt states the annual number slaughtered at 12,000,000, Mr M'Culloch, adopting as the basis of his calculation the estimate of Mr Luccock as regards England, (made so far back as the beginning of the century, it is believed,) gives the total number of sheep in Great Britain at 29,648,000, which, according to the rule of calculation observed by Mr Youatt, would afford an annual supply of 14,824,000; as he assumes that not fewer than one-half of the whole sheep stock of the country is annually consumed. That there should be little chance, under such circumstances, of an approximation to the real value of the proceeds and vast importance of this branch of our agricultural industry, it is in vain, with our present means of information, to expect.

But there are other, besides these chief sources of agricultural wealth, regarding which it is desirable we should procure full and correct details. Proper statistical returns should make us acquainted with the precise proportion of the inhabitants directly employed in the cultivation of the soil, as well permanently as occasionally, with the number dependent immediately upon that class: the number of horses used in tillage, and otherwise supported on agriculture: the quantity of grain consumed by horses, and otherwise, on the farm; and the quantity of seed sown; thus exhibiting the disposable amount of corn. A close approximation [illegible] by means of good returns, of the average

* Brit. Stat., vol. i., p. 405.

weight and value of roots, hay, &c.; the ordinary value of pasture, and how occupied. We might also be thus able to procure the probable quantity of foreign manures applied, and of what kinds.

Besides, it is not in vain to expect, I think, that in these returns the extent of land thoroughly drained as well as the accomplishment of other important improvements, might be pointed out; so that, upon a periodical investigation of these authentic tables, we might be able to mark the progress of agriculture in any specified district—nay, even a comparative view might be gained of the advantage of different systems of management and rates of employment. We might then also be able to note the condition of agriculture under altered circumstances, and as affected, after a while, by new laws. And when the spirit of improvement is abroad, we shall be able more narrowly to mark her beneficent hand, and thence imbibe all the sooner her grateful influences; or, when Science makes loud boast of her doings, the prejudiced and sceptical shall not be left long to complain that they listen to an uncertain sound, but that the green spots raised by her hand, being thus rendered early visible, will quickly allure even the bigoted and ignorant, made certain of her track, to follow her in it.

But, as I have said, full and correct information on all these subjects can only be acquired by the power and appliances which a nation can command. And that our Legislature has not hitherto applied itself to the task of attempting such a work, cannot surely be, that it lightly esteems the value of the result of such labours? That these results may not prove satisfactory, or in proportion to the expense, cannot be offered as a fair apology for not making the attempt; for no trial of any kind has yet been made. The impossibility of gaining the information required cannot be pleaded, for other nations have successfully performed the duty. The difficulty and intricacy of the machinery to effect so extensive a work, has been put forward as a bar to the attempt. But this, it appears to me, has arisen from an imperfect knowledge of the subject, and from regarding too anxiously, more the extensive field over which this machinery is required to operate, than to give our care to the construction of an engine which may surmount obstacles, which, after all, are only formidable in their limits, not in any inherent power they possess to baffle national effort.

No one need doubt that a Schedule of Queries could be devised calculated to obtain certain required information in any given district. Nor need it be questioned that, the kind of information demanded being, as it generally is, accessible to all, there will be found individuals, within the limits supposed, qualified to make the necessary returns correctly. What is thus accomplished in one locality can be done in all. The nation is made up of well-defined districts and parishes: similar operations being in action in each, the limits being marked, there can arise no confusion in the aggregate. The task, I humbly think, is neither so difficult, nor

will it prove so expensive, as many seem to suppose. Certainly the cost must be considered trifling to this great nation, in comparison with the mighty benefits to be derived from a correct knowledge of our agricultural statistics.

I shall now endeavour, Sir, with all submission, to point out the method by which it appears to me the statistics demanded might be collected and published by the Government. The nature of the information required I have already alluded to, and its details will be best explained by a reference to the Form of the Schedules appended.

I propose, then, that printed copies of these Schedules be distributed under the direction of Government, in the first place, to the various clergymen of the different parishes throughout Great Britain. I have preferred to devolve the charge of seeing to the proper execution of these papers, and their due return, to this intelligent and respected class, from a knowledge of the zeal and attention which, in Scotland, that reverend body devoted to a similar duty, more than once, in getting up the statistical account of that part of the kingdom for private individuals; and also because their professional duties cannot fail to lead them to be best acquainted with those within their bounds whom it is requisite they should call to their aid in making out the necessary returns. That there are parish officers in England upon whom this duty would more legitimately fall, and who would better perform the task, I am ignorant. But if there be, let such be chosen. The Schedules, then, being thus distributed, it should be required that the clergyman, or other officer, as the case may be, call in two or more intelligent individuals, well informed in agricultural matters and the practice of husbandry within the parish, to assist him in filling in the details. These to be regularly signed and attested by the parties so called upon, along with the clergyman, and to be returned to the county officer within a certified number of days.

For I would suggest that there should be a paid officer in each county to take up, prepare, and condense these returns into County Lists, to be in their turn transmitted to Government. The object of the appointment of such an official being, that, from his residence in, and knowledge of, the district, he may be able to discriminate, in some measure, whether the parish returns appear to have been correctly given, and the selection made by the clergyman of individuals to aid him, such as, under all the circumstances, are judicious; and failing their being so, that this officer should have the power of calling for a corrected return. With this view I would suggest that, in Scotland at any rate, the officer to whom these returns are made, should be the Sheriff-substitute of the county, who, from his knowledge otherwise of the inhabitants within his jurisdiction, would be well qualified to act as a check upon the faithfulness, and due attention to selection of assistance, with which the Schedules have been filled up. To [illegible] him farther in correcting the accuracy of the parish or dis-

trict returns, it might be right that this officer had power to summon to his counsel, five, or at least three individuals, well acquainted with agriculture, and practising that profession within the county, to aid him in the examination and scrutiny of these returns; and by whom the County Lists or returns should be subscribed previous to transmission, as subsequently proposed, to the Board of Trade.

It may be right to observe, that the *time* for the issue of the Schedules to the respective parishes, should not be earlier than the month of November in the year they are required—to allow a proper period to elapse, to admit of an accurate estimate being made of the probable productiveness of the crop. The Schedules being returnable to the county officer early in December, might be transmitted to the Board of Trade in time for publication in the beginning of the year.

At first sight, I have no doubt it may be thought that the information required would be better and more minutely obtained by the transmission of a copy of a Schedule, to be filled up by each of the occupiers of land within the district. But, besides that there would be great difficulty to compel returns so numerous, within due time, I am satisfied it is not to be expected that we could look for a faithful and true account from tenants of the full proceeds and productiveness, in many instances, of their individual occupations. Many would consider it inquisitorial, and a duty to be evaded, or lightly got rid of; while the fear of exposing in detail, to others, or it may be to their landlords or their agents, the value of their possessions, could not fail to operate against a true and fair return being made. Parochial, or district returns are liable to none of these objections, and could be obtained accurately enough, for all the purposes required, without having recourse to any individually scrutinising proceedings; and I am confident it will be found there are persons in every locality, of such discrimination and knowledge of rural affairs, and of such accurate observation as to what goes on around them, who, while they are not called upon to investigate and pronounce upon single cases, would have no difficulty in coming to a just and correct conclusion upon the average productiveness and general resources of the district within which they reside. Hence I am prepared, in such matters, to give more credit to an estimate derived directly from a general return, than to any calculation made up from evidence obtained by individual scrutiny. That the persons qualified to give correct answers to the queries contained in the Schedules, should be resident within the bounds of the district for which the returns are required, appears to me generally essential; at least no one can doubt that frequent opportunities of personal inspection, and an intimate acquaintance with the system of husbandry pursued in the locality, can alone confer a suitable knowledge of many of the details demanded. It may be from overlooking this essential

requisite of residence, and owing to ignorance of local peculiarities in soil and management in those employed to procure information, that such mistakes and anomalies appear on the face of it, as to cause great hesitation as to the degree of dependence to be placed upon the recent report relating to the agricultural statistics of Ireland, to which reference has already been made.

It may well be thought out of place, Sir, in a communication addressed to one conversant with the difficulties and cost of official labour, that I should attempt any estimate of the expense of collecting and publishing, under the sanction of the State, our required agricultural statistics.

I would fain hope I have been able to show, that the machinery necessary for collecting the information so much desired, is neither so intricate nor so formidable as the widespread field of its operations, or the apparently elaborate nature of the details to many, would have led them at first sight to expect. I trust, in comparison with the value of the results, the cost will not be deemed a formidable obstacle; and when we consider the pains bestowed by Government to obtain a minute and accurate knowledge of commercial and manufacturing affairs, of which monthly returns are published to the country, surely it cannot, with justice, withhold an effort to obtain information regarding our agricultural resources; without an accurate knowledge of which, all our exertions to be half informed will avail little, seeing the close connexion which subsists between agriculture and the great commercial and financial interests of the empire. Well would it have been for the country had we possessed a full and sound knowledge of facts, as regards the capabilities of our native soil, some years ago; and it is impossible to estimate the benefits which would have resulted from correct information as to our agricultural produce in 1846-7. A great part of the derangement of the currency might perhaps have been avoided, and much ruinous speculation and bankruptcy, in all likelihood, have had no existence.

The expense attending the plan I have above laid down, embraces, as I have intimated, the charge of only one paid officer in each county; and as I have proposed to devolve the duty pointed out upon an existing official, it may well be presumed it would require no large sum to remunerate him for this additional trouble. I am inclined to think £50 per annum, or rather on those years in which it may be thought right to call for statistical returns, would be held perfectly adequate. This sum, I assume, would suffice also to afford a small remuneration to the county assessors, I have recommended above, to cover their expenses.

Thus the whole expense of obtaining the full statistical information, I have supposed—the number of counties in Great Britain being eighty-three—would little exceed £4000 for this division of the empire. This expense being so trifling, I would be glad also, could it be arranged, that a small fee be paid to the clergymen or

other persons to whom the schedules were distributed, payable upon their due return, in order, in some measure, to insure their transmission within the specified time. I must confess myself too little acquainted with the social condition of Ireland, and the means available for procuring similar information there, to attempt to propose any plan at present for collecting the agricultural statistics of that part of the country, and consequently can say nothing of this further expense.

There is, no doubt, besides the above sum for Great Britain, the further expense of condensing and epitomising the information, and of printing and publishing the accounts. This, I presume, would fall necessarily to be performed by the Board of Trade; but as the details come prepared and abridged by the respective county officers in the form of "county returns," it is presumed the additional expense to that department would not be large.

As the census, statedly procured by Government, falls to be taken next year, permit me, in conclusion, to impress upon the Legislature, and more particularly upon the department of which you are the talented head, the necessity of having some process devised and submitted to Parliament previous to its prorogation, with a view to endeavour to obtain agricultural statistics somewhat worthy of this great nation, and upon which some reliance may be placed. The period of the recess will prove a most favourable and fitting opportunity for examining and discussing any method or forms proposed, so that members may return prepared to adopt some definite and suitable measure early next session, in time to go forth with the instructions for taking the census of 1851.

I have the honour to be, Sir, your obedient humble servant,

JOHN DUDGEON.

SPYLAW, 1*st June* 1850.

In explanation of the Forms of the Schedules appended, it is necessary that I mention, that in order to our being put in possession, in the first instance, of the whole agricultural statistics required, I propose that copies of both the Forms be distributed to the various parishes or districts of the United Kingdom. But presuming it to be thought advisable to procure "Returns" annually, or at short stated intervals, I conceive that the issue of "Form No. 1" would be quite sufficient, "Form No. 2" being intended only to be used at more distant intervals, to mark more minutely the progress or change in our agricultural prosperity and economy.

I may mention, I am prepared to test the practical application of both Forms of the Schedules, by exhibiting through them the agricultural statistics of the parish in which I reside, and these I will be glad to produce, completed if required, as illustrative of the mode of filling up.

No. I.

No. I.

FORM of SCHEDULE to procure AGRICULTURAL STATISTICS. 1850.

EXTENT AND DISTRIBUTION OF LAND IN ACRES.

1.	2.	3.	Grain.					Roots.			12.	Grass.			16.	17.
			4.	5.	6.	7.	8.	9.	10.	11.		13.	14.	15.		
Total.	Arable.	In crop.	Wheat.	Barley.	Oats.	Rye.	Beans and Pease.	Turnips.	Potatoes.	Mangold, Carrots, &c.	Flax.	Alternate grasses.	Improved permanent grass enclos.	Sheep walks and useful moors and uplands.	Woods.	Waste.

Remarks applicable to
Nos. 1
2
3
4
5
6
&c.
12
13
14
15
16
17

PRODUCE PER IMPERIAL ACRE. / DISPOSABLE LIVE STOCK.

Grain in Bushels.					23.	Roots in Tons.			27.	Cattle.		Sheep.		32.	33.	34.	Dairy Produce.		
18.	19.	20.	21.	22.		24.	25.	26.		28.	29.	30.	31.				35.	36.	
Wheat.	Barley.	Oats.	Rye.	Pease and Beans.	Flax. Tons.	Turnips.	Potatoes.	Mangold, Carrots, etc.	Hay in Tons.	Number maintained annually	Number sold.	Number maintained annually	Number sold. No.	Pigs sold.	Horses reared for sale or farm purposes. Number	Wool clipped in tons.	Butter.	Cheese.	Or their equivalent in Cash.
																			£ s. d.

Remarks applicable to
Nos. 18
19
20
21
22
23
&c.
28
29
30
31
32
33
34
&c.

No. II.

FORM of SCHEDULE to procure AGRICULTURAL STATISTICS. 1850.

Parish of

ANNUAL VALUE OF LAND.		AGRICULTURAL POPULATION.						8.	9.	IMPROVEMENTS, &c.						GENERAL REMARKS.
1.	2.	Number directly employed.				7.		Horses directly employed in the cultivation of the Land.	Grain consumed on the farm by horses, cattle, &c., seed, and farm labour.	10.	11.	Foreign and extra Manures used in Tons.				
Gross Rent or Value.	Parochial and Local Burdens per cent.	Permanently.		Occasionally.		Total number resident and immediately dependent on Agriculture.				Usual extent of Holdings.	Extent of Land thoroughly drained.	12.	13.	14.	15.	
		3. Men.	4. Women and Boys.	5. Men.	6. Women and Boys.			Number	Qrs.	Acres	Acres	Lime.	Bones.	Guano.	Chemical substances purely.	

Remarks applicable to

Nos. 1 — 10

2 — 11

3 — 12

4 — 13

5 — 14

6 — 15

7

8

9

THE FARMERS' NOTE-BOOK—NO. XXVIII.

Butter Making, and its Preservation. By J. TOWERS, M.R.A.S.E.—It is not my intention to describe, or dwell upon the practices of the dairy: they are multiform, important, and have been ably described by many writers, particularly by those who have treated upon Pastoral farming. A few words may, however, be appropriately addressed to persons who have retired to the country, are devoted to rural pursuits, and carry on a system of domestic economy, in small homesteads, which comprise four or five acres of land, consisting chiefly of pasture and garden ground. Personal experience during a period of years warrants the present attempt, and enables me to assert that, if two cows—particularly those of the true Jersey breed—be carefully attended to by the members of a family, a very ample quantity of milk, cream, and butter, of the richest and most delicious quality, can be obtained throughout the whole year. Colonel le Couteur has lately addressed the Council of the Royal Agricultural Society on the points which characterise the true Jersey animals, and facts have thus been elicited proving that, from *one cow* 16 lb. of butter have been weekly obtained during the flush of spring grass. The case is extreme, doubtless; but, within a few hundred yards of my present abode, I have observed three or four Jersey cows, the property of an affluent gentleman, who in the first instance imported the breed direct from that Channel island, and has for several years bred from the stock here: *the yield of butter from each*, I am assured, has during the last three seasons averaged 10 or 12 lb.!

Knowing the intrinsic value of genuine grass pasture, if it be thoroughly well managed, I claim an acre and a half for each cow; the half of it to be cut green every season for soiling, or more properly *stall feeding*, the other half to be closed in March for the dry hay crop—and thus alternately year after year. But I admit the claim also of many experienced parties, who, by direct facts, have been convinced that a milk-cow of first-rate quality may be kept, and made profitable to a family, upon very small pieces of ground. Thus, in that useful compendium, Baxter's *Library of Agricultural Knowledge*, Mr Hartley asserts "that the produce of one acre, well cultivated, will go farther than five acres of pasture, besides the value of manure. The following plots of ground produced sufficient to supply one cow with artificial food for one season. The proportions of allotment may serve in some measure as a guide to those who wish to crop the land to the best advantage. Name.

		Rood.	Poles.
No. 1.	Sown with red clover and rye grass,	0	19
2.	Lucern,	0	2
3.	Cow-grass and white clover,	0	17
4.	Red and white clover,	0	17
5.	Lucern,	0	10½
6.	Carrots,	0	2½
		1	28

"The above crops of lucern were cut four times, and the clover three times during the season, producing each time good crops; they were cut and given to her in a rack *in her hovel*, where she had a plot of about 18 perches to range in."

My own experience goes far to justify these statements in the main. In Thanet, I knew the value of grass growing among almost expended lucern, broad clover, and a little hay throughout the year. In Berkshire, a small orchard paddock was mown over during the spring of that richly productive season 1832, enough being taken every morning to supply green fodder for the stall; and yet so luxuriant was the herbage that we were obliged to cut, for dry hay, all that portion which the scythe had not reached. But then I had sown a few perches of lucern in April; and in that season of alternating gentle showers and very warm sunny gleams, so abundant was the herbage that we mowed a daily small supply till November, making in all five entire cuttings-over. Lucern, I am aware, is a doubtful crop in Scotland; but clover is not so; and it is proper to observe that, wherever Lucern is attempted, *chalk* should be amply present. My land was a sound hazel loam, rather gritty with red gravel sand: it was trenched three spits deep, the bottom of each trench being covered with reversed grass turf, sprinkled with salt.

I never could advocate the use of swedes, turnips, or kohl-rabi, because they were invariably found to taint the butter; hence with land of very limited extent, (under one acre of pasture,) dry clover and rye-grass hay must, in winter, be resorted to as a staple food. Carrots may be a valuable adjunct, and so may sound potatoes; but I have not brought them to the proof.

One thing is of great importance in domestic economy: it consists in family unanimity. If profit is to result from the keeping of animals for home supply, and the sale of superfluous products, the several members of the homestead must be industrious, and pull together. A cow should be carefully tended, kept perfectly clean, and milked at least twice a-day, without having recourse to hired labour. Thus it was that, so long as the junior branches of my family remained at home, we did everything within ourselves. In milking, the cow was *stripped* to the last drop, and the cream was churned by one party. The animal was maintained in complete health for years, without one single drench from any doctor,

as he is called, even at, or after the time of calving; the calves were suckled, and reared for the butcher in a very short time; and as the cow was never suffered to wander about for food, she always supplied milk in abundance. On one occasion, being permitted to range for a few hours in the orchard, the wind being cold and brisk from the east, she lost appetite, and showed some signs of becoming *hoven.* I had her immediately removed to the warm stall, and, acting upon the principle that the presence and accumulation of *carbonic acid* were the secondary causes of the existing distress, a drench of milk-warm water, about a quart, mixed with perhaps *half an ounce* of pure caustic liquor of *ammonia*, was given. Its effect was immediate: the acid gas was naturalised in the stomach by combination with the pure ammonia; and, its volume being thus removed, the symptoms vanished, and the cow was cured in a few minutes. I mention this fact in the hope that some one may verify it to his entire satisfaction. It was the only medicine of any kind that was ever made use of by me, or permitted to be given. Though irrelevant to the subject on hand, I feel it a duty to state that a waggon horse was seized with gripes at a wayside inn, close to my then residence in Wiltshire. He rolled in agony, and some of the crowd recommended one thing or other, which could not have relieved, while it must have inflicted injury. Begging every one to desist, or to aid me efficiently, by preventing the violent struggles of the horse, I prepared a pint draught of tepid water blended with about an ounce, by measure, of the best sulphuric ether, which was carefully given. Quietude followed, and the animal went on in his place with the waggon in less than half-an-hour. Ether, I knew, had been used to a very great extent at Nottingham with success; and I seized the occasion to bring it to the proof. There is, however, some difficulty to mix the ingredients with any precision, on account of the extreme volatility of the ether. Despatch is required, and the water must be warm—not more so than new milk.

This digression will, I hope, be excused; and I now come to the chief object of the article, which is the preparation of butter with a view to preserve it in an unchanged and healthful condition.

It will be needless to enter into the ordinary processes of churning. We ourselves almost always used the box-hand churn, (so completely lescribed and figured in the *Book of the Farm*, new edition, Part ii ... 277,) and rarely with any failure or disappointment, unless it ... in extremely hot or very cold weather, when every one must have experienced some perplexity.* On this and other accounts it is to be hoped that the new American churn, lately exhibited, may be found to bear the test of experience, and by which we see that 4 or 5 lb. of prime fresh butter were, ere the late cold

* ... the closing remarks.

weather, readily made from as many quarts of good cream, and two quarts of pure sweet milk. Be this as it may, there has been published in that amusing work by Dr Forbes, entitled *The Physician's Holiday*, a statement of the Swiss practice of butter-making, which bears the stamp of genuine truth, and now claims the attention of our readers. On the process for preserving butter, as adopted in Switzerland, he says:—

It is a singular fact, and one I could not bring myself to believe, until I had it confirmed to me by repeated testimony, that the whole of the butter produced in any one of these Alpine pastures, is preserved sweet, or at least perfectly fit for use, through the whole season, *without any admixture of salt.* The following is the way in which it is treated:—A narrow deal board, not more than four or five inches wide, is fixed horizontally in an open place in the dairy of the chalet; wooden pins from two to three feet long are fixed in an upright position in this, their whole length projecting above its surface. As the butter is made it is daily placed around these pins, (one at a time,) beginning at their lower end, and in a mass not exceeding at first the width of the board. Every day as more butter is made, it is added to the precious portion around the pin, the diameter of the growing mass being gradually enlarged *upwards*, until the surface overhangs the base to a considerable extent, like an inverted beehive. When one pin is filled, another is proceeded with in like manner, and so on. The exposed surface of these masses soon becomes covered with a sort of hard film, which effectually excludes the access of air; and this circumstance, with two others—namely, the complete *expression of milk* from the butter, and the unobstructed circulation of a cool mountain air through the chalet, will go far to explain how butter so treated can remain so long without being spoiled.

It should appear impossible to adopt this method of treating fresh-made butter in our warmer and moist climate; but though not recommending it further than as a means among others of removing the buttermilk, (acidulous casein,) I have preferred to present it entire, especially as Dr Forbes observes in the next paragraph—

I should like this experiment to be tried in some of our English (Scotch rather) dairies. The Swiss manipulators had no doubt of the trial succeeding, provided all the above-mentioned requisites of complete expression of the milk, a low temperature, and a free circulation of air were obtained.

It is very probable that if the butter thus preserved from June or July to October, were then made use of as the supply of the daily breakfast, it might not be found exactly *good*, according to our acceptation of the term, as applied to so delicate an article of diet; yet there can be no doubt that butter so treated is preserved from all putrescence, and it is from *it* that the whole winter store of the inhabitants of Switzerland is obtained.

The mode of preparing this winter store of butter seems to me much more important, and I will here describe it in detail, as I believe it is little known in England, and ought to be more so. I refer to what is called in the Valais, and in Piedmont, *boiled butter*, (*beurre cuit*,) in which this article of diet is universally used, at least for all purposes of cookery. In looking at the horrid compound sold in England as *salt butter*, at least the cheaper sorts of it used by the poorer classes, I cannot but believe that its supercession by the boiled butter of Switzerland would be advantageous both to the comfort and health of a large proportion of our countrymen.

It can hardly be believed that such an offensive, briny, and semi-putrid mass as the cheaper kinds of our salt butter, can be used without serious detriment to the health of the consumers, any more than the salted meat formerly issued to our seamen was so. The only difference in the two cases is the comparative quantity consumed in each case : in *itself* I am disposed to regard the rancid butter as the more unwholesome matter of the two. The boiled butter, while infinitely more palatable, is neither saline nor rancid; and consequently is calculated to be more easily digested, and to produce a more wholesome material for absorption into the system.

Dr Forbes then gives the receipt for making the boiled butter, as he obtained it from several parties thoroughly versed in the practice. Thus:—

Formula.—Into a clean copper pan (better no doubt tinned) put any quantity of butter, say from 20 to 40 lb., and place it over a *very* gentle fire, so that the butter may melt slowly; and let the heat be so graduated that the melted mass *shall not come to the boil in less than about two hours.* During all this time the butter must be frequently stirred, say once in five or ten minutes, so that the mass may be thoroughly intermixed, and the top and bottom change places from time to time. When the melted mass boils, the fire must be so regulated as to *keep* the butter at a *gentle boil* for about two hours more, the stirring being still continued, but not of necessity so frequently as before. The vessel is then to be removed from the fire and set to cool, and settle, still gradually, the process of cooling being supposed to require about two hours. The melted mass is then, while still quite tepid, to be carefully poured into the crock or jar in which it is to be kept. In the process of cooling there is deposited a whitish *cheesy* sediment, (proportioned to the quantity of butter,) which is to be carefully prevented from intermixing with the preserved butter.* As might be expected, there are some variations in the practice of different individuals. One very experienced man assured me that a much shorter time than two hours need elapse between the setting of the vessel on the fire and the bringing the butter to the boiling point. Another said that the time should bear some relation to the quantity of material used—an average period of ten minutes being allowed for every pound. The same party told me that if the butter employed was not quite sweet, the addition of a slice of *bread* and a slice of onion (?) will remove this; also, that the appearance of the *grounds* rising up to the top when the mass is stirred is itself a proof that the coction is sufficient. My guide at Chamouni told me that his wife usually added a small portion of salt to the mass in the early stage of boiling.

Everybody agreed in asserting that butter so preserved will last *for years* perfectly good, without any particular precautions being taken to keep it from the air, or without the slightest addition of salt. Indeed I myself tasted, more than once, butter so prepared, fully twelve months after preparation, and found it without the slightest taint. It wanted the flavour of fresh butter, but seemed to me infinitely more palatable than our coarse salt butter. This boiled butter, however, is not commonly used, even in Switzerland, as a condiment with bread, as fresh butter is, but merely as an article in cooking, for which purpose it is said to be even better than newly made butter. I saw at the Hôtel d'Angleterre in Chamouni, the very jar out of which all the butter used in the kitchen was taken; and certainly it would not be easy to find more delicate cookery than we there met with.

I have thus extracted all the details of the dairy processes given by Dr Forbes in his late work. They are curious, and so far instructive that, at the least, they interpret the cause of that rancidity which degrades a very large proportion of the salted butter imported from Ireland for winter supply. Were it possible for the inhabitants of the larger cities and towns to procure even a moderate quantity of perfectly sweet fresh butter, few would think of a substitute; but the thing is impossible; and even in such a third-rate town as is Croydon, with its eighteen to twenty thousand of inhabitants, it is found difficult for a family to obtain a single pound of fairly good fresh butter, *once a-week*, at the high price of 1s. 2d. to 1s. 5d. What, then, is to be done for the supply of the humbler classes, who can barely afford 8d. per pound?

Dr Forbes has excited the attention of some who are inclined to investigate causes; and thus we perceive that chemists have been

* [illegible] grounds are very palatable and nutrient; they are constantly used [illegible]

induced to refer to the science of butter-making. Mr Way in his recent lecture before the Council of the English Agricultural Society, has shown that, besides the three understood constituents of sweet milk, there exists a fourth, (not however unknown in the laboratory,) the presence of which had been generally overlooked —namely, the *sweet principle* or *sugar of milk.* When milk is first drawn from the cow, it appears to exert a slightly *alkaline* reaction, in consequence of the existence of a little free soda. But by a chemical change, which gradually takes place, the milk-sugar is converted into lactic acid, (called, by chemists of bygone days, *acid of sugar of milk:*) the soda or alkaline principle becomes neutralised—the milk turns sour, curdles, and the casein or cheese-curd separates. In cream, some of the casein and other fluids of the milk remain, and are subjected to the action of the churn. Acidity is one of the results; and thus the residuum after the separation of butter—called *buttermilk*—is always sour. The fluid of course consists of the *serum lactis*, or whey, lactic acid, and the cheese-curd or casein. At this point it will be satisfactory to quote a few lines from the lecture by Professor Way alluded to; they will confirm general principles:—

Fresh milk of the cow consists of	Casein or pure curd,	4·48	per cent.
... ...	Oily principle—butter,	3·13	...
... ...	Milk-sugar,	4·77	...
... ...	Saline matter, soda,	0·60	...
... ...	Water,	87·02	...
		100·00	

Cream is a concentration of milk; the butter by its lightness rising, and with it a certain quantity of casein. The separation of *butter* in churning is not purely a mechanical action, for one or two circumstances favour the notion, that chemical action of some kind occurs during the operation. The casein retained by the cream, though not exceeding one-half per cent of the weight of the butter, yet is sufficient to make the preservation of the butter difficult—*for it is never entirely free from casein and milk-sugar.* The method of preserving butter, by salting and pressure, is intended to meet its tendency to become rancid. There was a method noticed by the late Mr Rham in his *Dictionary of the Farm,* and which was founded on the separation of the casein and buttermilk. It consisted *in melting the butter,* and *allowing the casein and water to separate and fall to the bottom.*

Here we find the Swiss process clearly alluded to; but after all is said and done, nothing can be found as *a substitute* for well-made, thoroughly washed, and kneaded *new made butter.* We may salt or boil, and thus preserve butter throughout a winter; but the delicate odour, and *peculiarly* delicious flavour of fresh and well manipulated grass butter are gone, and we therefore must be contented with such substitutes for winter use, as the utmost aptitude and cleanliness of the dairy can supply.

I close this article by stating that, on the 24th April, the American box rotatory churn was exhibited and tried at a meeting of the Council of the Royal Agricultural Society, with the clearest success. From 5 lb. of cream raised to the temperature of 62½°

Fahrenheit, 5¼ lb. of fine fresh butter were produced in about minutes. The details given in the report were ample; and will doubtless be generally published in the provincial press before this article can appear in the *Journal of Agriculture*. a final remark, a gentleman has just assured me that, repeated experiments, he proved that if in cold weather the be brought to exactly 62½°, or not beyond 63°, and the chu the same, butter will *never fail* to come in 25 to 30 minutes hot weather, to avoid oiliness, the apartment should be coole a stream of fresh air passed through a wetted mat, and *ice a the cream* should be used to reduce its heat to 62½°.

*Shaw's and Corbett's Digest of Agricultural Customs.**—It intention to make use of this valuable digest of one of the Books of last session, for the purpose of showing, in as con form as possible, the position of the farmer over a large port the country. We confess to have been exceedingly surpris the result of the Evidence which this committee has been the of bringing together. That a large portion of England is farmed is admitted by every one; but that anything like so an extent as this evidence proves to be so, we were by no prepared to believe. There is, of course, a great divers opinion as to the propriety of any legislative interference be landlord and tenant, for the purpose of giving compensati the latter for unexhausted improvement, or in other words, " *ant-right.*" We are perfectly satisfied that, independent o assistance from Parliament, "tenant-right" *may* be secur mutual agreement in all cases, except, perhaps, on entailed e Our surprise is, that the evident advantages of this system not have been universally recognised; especially when the evi shows so clearly, that want of proper security to the tenan bad farming, are synonymous and convertible terms; and that districts, as portions of Norfolk, Lincoln, and Northumbe which are notoriously the best farmed and the highest le precisely those in which leases and compensation for unexh improvements are the rule of practice. Apart from all po considerations, which, of course, have no place in this Journa Evidence is full of instruction to all; and whilst so much ha said about bad farming, the wonder certainly is—how it cou expected to be better under such bad conditions.

In the following table we have shown the information fur by the Evidence, as to the various customs with regard to t entry, term of holding, whether from year to year or on compensation allowed for unexhausted improvements, &c.

* Digest of Evidence, taken before a Committee of the House of Comm Agricultural Customs in England and Wales. By Shaw and Corbett. R London.

CUSTOMS.

COUNTIES.	Term of entry.	Term of holding.	To whom the first crop belongs.	Compensation allowed for unexhausted improvements.	REMARKS.
BEDFORD,	Michaelmas	Mostly yearly	The entering tenant pays for turnips and hay	None allowed	The Duke of Bedford and one or two others grant leases.
BERKS, .	The same	—	The entering tenant pays for all acts of husbandry, and takes the straw and hay at a valuation	None allowed	
BUCKS, .	The same	—	The same	None allowed	
CAMBRIDGE,	The same	—	The entering tenant	None allowed	
DERBY, .	Ladyday	—	The entering tenant	No compensation allowed for draining; but bones, if unexhausted, are paid for.	The time for which an allowance is made for bones extends over six years.
DEVON, .	Ladyday and Michaelmas	No leases	The entering tenant	None allowed	The manure is sold by auction by the outgoing tenant.
DORSET, .	Ladyday	—	The outgoing tenant	None allowed	
DURHAM, .	May 13	Mostly from year to year	The outgoing tenant	—	The first rent is not paid until the tenant has been one year in possession.
ESSEX, .	Michaelmas	Yearly	—	None allowed	The outgoing tenant is paid by the incoming tenant for the dung-fallows. The tenant constructs the buildings, the landlord finding the materials. Rents paid quarterly.
GLOUCESTER,	Some Ladyday, others Michaelmas	Yearly	The entering tenant	None allowed	
HANTS, .	Michaelmas	—	—	None allowed	The entering tenant takes possession of the fallows at the Ladyday previous to entering, and prepares his own turnip crop.
HERTFORD,	Michaelmas	Yearly	—	—	The same as in Hants.
HEREFORD,	February 2	Yearly	The outgoing tenant has the wheat crop	None allowed	
KENT, .	Oct. 11, or Sept. 29	Yearly	—	An allowance made for draining and coppice	

[*Continued*

CUSTOMS—(*Continued.*)

COUNTIES.	Term of entry.	Term of holding	To whom the first crop belongs.	Compensation allowed for unexhausted improvements.	REMARKS.
LANCASHIRE & CHESHIRE,	The land on Feb. 2, and the house at May	Yearly	The outgoing tenant has the wheat crop	None allowed	
LEICESTER,	Ladyday	At will	The incoming tenant	None allowed	
LINCOLN, (*Wolds,*) .	Ladyday	Leases	The outgoing tenant has the wheat and barley	For chalking, bones, claying the light soils	The landlord pays for tiles, but not to exceed £14 in one year.
MIDDLESEX,	----	Both from year to year and leases	----	----	
NORFOLK, .	Oct. 11	Leases	Custom varies	----	
NORTHAMPTON,	Ladyday	No leases	----	----	The outgoing tenant is paid for ploughing, &c.
NORTHUMBERLAND, .	May 13	Few leases, except in the north	The outgoing tenant has the awaygoing crop	None allowed	
NOTTINGHAM,	Ladyday	----	The same	Very little allowed, except for bones, rape-cake, &c.	The tenant erects the building upon wooden posts, so as to remove them upon the expiration of his tenancy
OXFORD, .	Michaelmas	----	----	None allowed	
SALOP, .	March 25	Mostly from year to year	----	None allowed	
SOMERSET,	Upon dairy farms, Mar 25; in others, Michaelmas	Yearly	----	None allowed	
STAFFORD, .	Ladyday	Yearly	The entering tenant has one-third of the wheat after a fallow, and one half after green crops	None allowed	
SUFFOLK,	Oct. 11	Eight years' leases	The entering tenant pays rent and taxes on the fallows, and for acts of husbandry	None allowed	The entering tenant has also the hay at a valuation.
SURREY, .	----	Yearly	----	Draining allowed for, over ten or twelve years	According to what is called "*the full custom,*" the outgoing tenant is paid for dung, lime, sheep-foldings, acts of husbandry, and rents and taxes of fallows.

[*Continued.*

CUSTOMS—(*Continued.*)

COUNTIES.	Term of entry.	Term of holding.	To whom the first crop belongs.	Compensation allowed for unexhausted improvements.	REMARKS.
SUSSEX, .	Sept. 29	~~	~~	The incoming tenant pays for acts of husbandry, and for underwood, &c.	The above customs, in some cases, extend to Sussex.
WARWICK, .	Ladyday	Leases are very rare	The outgoing tenant generally disposes of it to the incoming tenant	Bones allowed for. Drains are allowed for, if within three years	
WILTS, .	Pasture at Ladyday, arable at Michaelmas	~~	The entering tenant comes in and prepares his own wheat crop and turnip land	None allowed	
WORCESTER,	At all the different terms	Few leases	The last crop belongs to the outgoing tenant		
YORK, . (*East Riding*,)	Ladyday	Yearly	The outgoing tenant has the crop of about one fourth of the arable land, and pays rent for that alone	None allowed, except a trifle for oil-cake	
YORK, . (*North Riding*,)	The same	The same	The same	None allowed	
YORK, . . (*West Riding*,)	~~	~~	The outgoing tenant is paid for working fallows		

It would be difficult to place agriculture under more short-sighted, ignorant conditions than some of the above customs—many of which have, according to the evidence, been fixed before the use of artificial food or manures was known; and yet these customs have still the force of law! No leases granted, along with no compensation allowed for unexhausted improvements, are the best possible guarantees for bad farming. The tenant farmer, who assigned as a reason for his bad farming, to one of the witnesses, that he had expected his landlord to die almost every day during the last seven years, is a type of too much of the farming in England. But whose fault is this? and who suffers most by such management?—the tenant who has only one year's interest in the estate, or the landowner, who must have at least a life interest in it?

It may possibly be objected, that the tenantry are unable and unwilling to further improvements. Let us see what the evidence says on this point, as well as on the extent to which improvements are necessary.

In Hampshire, Mr Owen assures us that, with security, the
would risk his capital, and that a tenant from year to
cannot, as a prudent man, do so.

In Bucks, the clay land is stated to be much in w
drainage.

In Cambridge, the lands held from year to year are
cultivated.

In Devonshire, where no leases are granted, it is usual in
places to take as many crops as the land will bear, an
leave it till nature restores its fertility. Farmers are, ho
quite ready to do better, if they could only get security

In Dorsetshire, much more would be done if there wa
security.

In Essex, as soon as ever a farm is taken on lease there is a
improvement, and some of the land would grow half as
again, if there was only security and proper cultivation

In Gloucester, the vales suffer dreadfully from wet; and
tenants would drain fast enough if there was only se
Some of the land is only producing one-third of wh
capable.

In Hereford, a great extent of land requires draining;
were done, witness says the produce might be doubled.

In Hertford, the farms on lease, and those from year to
could be distinguished by a stranger. In one towns
which the former are $\frac{1}{4}$th, and the latter $\frac{3}{4}$ths of its e
Mr Lattimore states "There is as much stock kept on t
as there is upon the $\frac{3}{4}$th, there is double as much
fattened on the $\frac{1}{4}$th, and there is 58 per cent more
employed on that $\frac{1}{4}$th, and there is one-third more grai
duced on it per acre."

In Kent, Mr E. C. Hughes says the cultivation would be
better than Lincolnshire, if proper security would be
"Portions of the county, in consequence of security
given, have become the best cultivated, from being th
worst."

In Lancashire, the drainage has been followed by the
bones, and one-third more cattle can be kept upon l
managed.

In Leicester, if proper security were given, drainage wo
once be done. A great extent of land requires it.

In Northampton, the soil is said to be capable of producin
third more than it does at present.

In Northumberland, Mr Ramsay and Mr Crisp are b
opinion that, if proper security were given, the land wo
improved to the utmost.

In Shropshire, with security, "all farming operations wo
set about with more earnestness, and carried throug
more determination than can prudently be done now."

In Somerset, "the old system still exists of three white crops, and then laying the land down to grass for two or three years."

In Suffolk, Mr J. G. Cooper thinks, that if payment for unexhausted improvements were made, the employment of labourers up to the expiration of the lease would be secured.

In Warwick, the outlay of capital is checked by the feeling of want of security.

In Wiltshire, the agreements have never been altered since wheat, barley, and natural grass, was the only known system of cultivation.

In Yorkshire, (*North Riding*,) the course of cropping is two white crops and fallow, under which the land gets poorer every year.

In Yorkshire, (*East Riding*, *Holderness*,) the above rotation is also followed.

"Of all the official inquiries lately granted, few promise to be more really serviceable in their results than that made by the Committee on Agricultural Customs. However desirable, and however well attempted, none but the power of Parliament could have compared the cultivation of one district with that of another, in the strikingly efficient manner it has now been done. The above evidence furnishes the history and the requirements of agriculture upon the evidence of fifty men, instead of any one; their several testimonies, moreover, being taken and tested with a perhaps more than neutral impartiality, that must make every fact established still more valuable and deserving of attention." Upon these grounds, then, we think the above extracts, showing the capabilities of increased production, and wish for improvement amongst tenant farmers, worthy of the most serious attention. The case is, if possible, made still stronger by a comparison with the system of farming in Lincolnshire, where leases and payment for unexhausted improvements are universal.

"In Lincolnshire, some fifty years ago," says Mr Brown, "we were in a wretched state. *In the Wolds, the produce has been doubled, and artificial manures are now applied to every crop.*"

It is strange, in the nineteenth century, to be told by one of the witnesses, that he does not think one-tenth of the land in Great Britain is held under lease.

There is some difference of opinion amongst the gentlemen examined, as to whether a lease, or merely payment for unexhausted improvements, is the most preferable way of letting land. A few only advocated what we consider to be the best—a combination of the two systems—namely, a long lease, with arrangements for the last four years of occupancy.

It appears that, as the law now stands, except where it is arranged by special agreement, or a very clearly-defined custom, no tenant can claim compensation for improvements; nor is the

law at all clear as to what fixtures or erections the tenant can remove.

We are surprised to see that it is the opinion of some of the witnesses that as much as two-thirds of the land is tied up by family settlement, by church holdings, or encumbered by mortgages. With regard to land held under family settlements, the recent Drainage Acts have afforded facilities for improvements in draining,—though whether they reach the church lands or not, we are not certain.

As an example of the way in which allowances are made for chalking, marling, or claying, which are considered permanent improvements, the following table is given by Mr Harding:—

Years.	Acres.		1849.	1850.	1851	1852.	1853.	1854.	1855.	1856.	1857.	1858.
			£	£	£	£ s.		£ s.		£		£
1849	50	at £2	100									
1850	50	do.		100								
1851	50				100							
1852	25	4th year dropping 1-4th to landlord	25			50						
			75									
1853		do.	25	25			None.					
			50	75								
1854	25	do.	25	25	25			50 0				
			25	50	75							
1855		do.	25	25	25	12 10			None.			
				25	50	37 10						
1856	25	do.		25	25	12 10						
					25	25 0				50		
1857		do.			25	12 10		12 10	.	...	None.	
						12 10		37 10				
1858	10	do.				12 10		12 10				
												20
								25 0		50		25
												50
								Claim to outgoing tenant,				£95

... gard to allowances ... made for lime, bones, guano, ... and suchlike, as illustrating how long these manures are ... posed to act, we quote the following opinions:—

... Lime lasts four years, says Mr Chandler. Not more than ... ears, says Mr Pinches. Three or four years, another ... ess thinks. Five years, says the witness from Notts. Six ... Mr Kilby (Leicester) thinks, ought to be allowed for ime

2d, "For bones, guano, and chemical manures, when no corn crop has followed, the whole to be paid for. One corn crop, half the expense. Two corn crops, nothing."—*(Mr Chandler's evidence.)*

Mr Ramsay thinks no allowance should be made for guano.

Another witness states that he has seen the benefit of bones after seven years, but never allows more than four.

For oil-cake, it is calculated that one-third of the expense should be paid by the incoming tenant.

In addition to the above important subjects, some incidental information is given on the advantages of breaking up inferior and undrained grass land. On this point landlords are proverbially tenacious. Certainly as much so as when no other source of hay was known.

Without any wish to allude to the evidence in a political point of view, it furnishes matter for the most serious thought, that such a large portion of the country should be so badly farmed; and that the advantage of liberal covenants between landlord and tenant should be so little known, is indeed surprising. To both landowner and tenant the digest of the evidence is of importance; to the former as showing the advantages which other owners have received by liberal management, and to the latter, as having half of the bargain to make, it shows him the advantages which his brother farmers in other districts have reaped under proper business-like security. Those landowners who still persist in managing their estates according to the customs of their ancestors, are more to be pitied than blamed, as they inflict a severer punishment on themselves than any Act of Parliament could possibly attempt. M. B.

*Ornamental and Domestic Poultry.**—An exceedingly interesting book, with this title, has been written by the Rev. E. S. Dixon, M.A., Rector of Intwood-with-Keswick, which, with many striking traits of resemblance to the well-known and delightful volume of the Rev. Gilbert White, on the natural history of Selborne, is in some respects far more valuable and interesting. Premising that our warm approbation of Mr Dixon's publication is absolutely disinterested in every respect, and that we have not even any personal acquaintance with him—or with any friends of his or with his publishers—we venture to assert that its pages may be read by the philosopher for its research and reasoning, the scholar for its elegance, the ornithologist for its science, and the poultry-keeper for the practical information it conveys.

The Preface informs us that the author, (who, with the affectionate wife to whose memory the work is inscribed, kept a few fowls

---

* Ornamental and Domestic Poultry: their History and Management. By the Rev. Edmund Saul Dixon, M.A. London, 1848.

for amusement in a small suburban residence,) found such a dearth of correct information, and so many contradictions in most of the current poultry-books, that he acquired the habit of making notes from time to time of the questions which gave him the most trouble to solve. These 'notes' at length assumed a connected form, and were sent to the editor of the *Gardener's Chronicle*, who judiciously gave them space in that periodical. On referring to its pages we perceive that the chapter on "Guinea-fowl," was the pioneer in the experiment on the public judgment. The "Egyptian Goose" immediately followed; and the success of the series was then certain. In the book before us, precedence has been given to "Pea-fowl," whose "brilliant gorgeousness," as exhibited in the male bird, rendered it worthy of advancement to "the train of imperial Juno."

"Poultry," observes the author, "has been too much undervalued as a means of study and a field of observation. Insignificant, and to us valueless wild animals, brought from a distance, about whose history and habits we can learn little or nothing, are received with respectful attention by men of education and ability, are embalmed in spirits, treasured in museums, and portrayed by artists; but a class of creatures inferior to few on the earth in beauty—useful, companionable, and of great value in an economical point of view—are disregarded and disdained." This ought not to be. The fowls which the Almighty commanded to multiply on the earth for our use, deserve not only the attention of the naturalist, but that of every agriculturist and cottager, who can keep any of the domestic kinds; and though the ox and the sheep are nobler, and far more important, objects of consideration to the cattle-farmer, a much larger proportion of her Majesty's subjects are individually interested in learning the natural history and practical management of poultry.

Besides, there are subjects belonging to our domestic poultry, intimately connected with those affecting the domestic quadrupeds; for instance, the results of cross-breeding—the multiplication of varieties—the effects of climate on the animal physiology—the transmission of habits—the enlightened poultry-keeper has more ample and much more frequent opportunities for acquiring information and experience on such subjects than the farmer, who, [illegible] affairs of the poultry-yard, confines his observations [illegible] ted variety of animals, and whose less rapid [illegible] ations do not afford such frequent opportunities [illegible] nvestigation. To methodise our brief analysis of the book, we [illegible] ll treat it in two ways; first, as a work of theory and natural [illegible]; second, as one of practical information.

M[illegible] D[illegible] [illegible] the Preface:—

[illegible] respecting what is called the "origin" of [illegible] stic races, has been to my own mind irresistible, having begun the investi- [illegible] wild theory, although so fashionable

of late, that our tame breeds or varieties are the result of cross-breeding between undomesticated animals, fertile *inter se*. It will be found, I imagine, on strict inquiry, that the most careful breeding will only fix and make prominent certain peculiar features, or points that are observed in certain families of the same aboriginal species, —no more; and that the whole world might be challenged to give evidence (such as would be admitted in an English court of justice) that any permanent intermediate variety of bird or animal, that would continue to reproduce offspring like itself, and not reverting to either individual type, had been originated by the crossing of any two wild species. Very numerous instances of the failure of such experimental attempts might be adduced. As to the great immutability of species, so closely allied to the investigation of the different varieties of poultry, as far as my own limited researches have gone—and they have been confined almost entirely to birds under the influence of man—they have led me to the conclusion that even some species and varieties are much more permanent, independent, and ancient, than is currently believed at the present day. This result has been to me unavoidable, as well as unexpected; for, as before mentioned, I started with a great idea of the powerful transmuting influence of time, changed climate, and increased food. My present conviction is, that the diversities which we see in the most nearly allied species of birds, are not produced by any such influences, nor by hybridisation; but that each distinct species, however nearly resembling any other, has been produced by a creative power. I am even disposed to adopt this view towards many forms that are considered as mere varieties. *As far as I have been able to ascertain facts*, hybrids that *are* fertile are even then saved from being posteritiless, (to coin a word,) only by their progeny rapidly reverting to the type of one parent or the other; so that no intermediate race is founded. Things very soon go on as they went before, or they cease to go on at all. This is the case with varieties also, and is well known to breeders as one of the most inflexible difficulties they have to contend with—called by them "crying back." This circumstance first led me to suspect the permanence and antiquity of varieties, and even of what are called "improvements" and "new breeds." Half of the mongrels that one sees are only transition forms, passing back to the type of one or other original progenitor. At least my own eye can detect such to be frequently the apparent fact in the case of domestic fowls. Any analogies from plants must be cautiously applied to animals; but, even in the vegetable kingdom, the number and reproductive power of hybrids is apparently greater than it really is, owing to the facility of propagation by extension—by which means a perfectly sterile individual can be multiplied and kept in existence for many hundred years; whereas a half-bred bird or animal would in a short time disappear, and leave no trace. I have not met with one authenticated fact of the race of pheasants having been really incorporated with fowls, so as to originate a mixed race capable of continuation with itself, but with many that prove the extreme improbability of such a thing happening. The vulgar notions that hens kept by the sides of plantations *therefore* become the mothers of half-bred chickens, by whom pheasant blood is again transmitted to their progeny—and that *hens*, whose plumage in some measure resembles that of the *cock* pheasant, are *therefore* hybrid individuals,—are too vague to be listened to in the absence of clearer evidence, which is not yet forthcoming. But it will not be easy to eradicate this prejudice from the public mind.

In the portion of the work which is devoted to "the pheasant Malay fowl," which is supposed by many to be a cross between the pheasant and the common fowl, he demolishes that popular theory, not only on Buffon's authority, corroborated by that of persons who had the means of judging, but from various circumstances which prove that, although birds are often produced between the pheasant and common fowl, their progeny are barren, and therefore are not what are called the pheasant Malay fowl, which are prolific.

It required some courage, as well as patient experimental investigation and trouble—though in Mr Dixon's case *molliter studio fallente laborem*—to combat the popular belief respecting this breed of fowls. He pursues the subject in another part of the book in so agreeable a manner that we must lengthen our extract:—

The precise lines of demarcation of each (viz., genus, species, and variety) are extremely difficult to define. It is generally assumed that individuals of different genera will refuse to breed together; that the mules between different species are sterile; and that varieties are merely accidental and recent examples of a slight alteration in the external character of species, which do not affect their continuance as a race, and perhaps disappear altogether after a time. But in opposition to this, hybrids have been produced between the Egyptian goose and the penguin duck, also between the common fowl and the Guinea fowl; prolific mules are constantly occurring between all sorts of species of geese; and it is well and practically known that, though varieties breed freely with each other, nothing is so difficult as to establish a cross that shall be a perfect amalgamation of two distinct varieties: even individual peculiarities are reproduced in the course of generations.

We shall not follow him farther through his able and ingenious course of observations respecting the existing diversities of animals —his opinion being, that the extinction of races has occasioned the breaks in the chain, and that no new forms have been created since the creation of man. He admits that such an instance as that of the new Leicester or Dishley breed of sheep affords some ground of contradiction; but he gets over this by supposing that Mr Bakewell (the gentleman who established that breed) concealed and destroyed every means by which he effected his purpose. The principle he lays down for future research is—and we fully concur with him—that man, though generally a destroyer of the brute creation, is also a selecter and improver, but never an originator. What, after all, did Mr Bakewell do but improve the race of sheep by judicious selection of individuals from kindred breeds, and, by breeding in and in with this selection, fix on the best accidental varieties, propagate from them, and still continue to select the superior produce? All this is strictly analogous to the propagation of the most approved specimens of our domestic poultry.

The subject is altogether one of much difficulty. If it be assumed that the forms of all animals may gradually change in order to their adaptation to circumstances, there is no limit of exaggeration and absurdity to which this theory may not be pushed. Yet Buffon adopts it in endeavouring to account for the existence of the various species of pheasants. Now if one bird may be in course of time transmuted into another, Lord Monboddo's whimsical notion that men and women were originally furnished with tails would not be absurd: the acquired habit of wearing trousers and petticoats might in the course of years have worn away by friction even the rudiments of tails. Mr Dixon maintains unhesitatingly, "that it was not man or his domestication, or any inherent tendency in the creatures themselves, that gave feathered crests to the Poland fowl, dwarfed the bantam, expanded the Dorking, enlarged the Malay and Cochin China fowl, inspired courage to the game-cock, or made the hen, next to woman, the most exemplary of mothers—unless we believe it was man who arranged the strata in the ribs of the earth, and prescribed to the [illegible] unchanging boundaries." Like his predecessor of Sel- [illegible] Dixon has quoted passages from Greek and Roman

authors, and with great taste and judgment. For the benefit of us country gentlemen he has, however, given translations of them.

Our author's theory respecting the absolute wildness of the mute swan, *Cygnus olor*, is probably correct. He asserts that the terms tame hyæna, tame wolf, tame rat, domestic pheasant, and domestic swallow, would not be more inappropriate than that of tame swan, which, though they will come to their keeper's call, and stay at home, because they cannot range abroad, are ever disposed to wildness. "To compare the relations which exist between them and man, with those by which we retain the goose and the common fowl, is about as correct as to believe that the same temper and disposition influence the faithful dog and the wildest jackal of the wilderness." Swans he pronounces to be *feræ naturæ* to all intents, though they may have some local attachments. They must be made to undergo the operation of pinioning—*i. e.* the amputation of part of the wing—else they will fly away from rivers or ponds to others which they may like better. He illustrates his notion of the really non-domestication of swans in this playful and original style:—

Those who wish to make themselves acquainted with the habits and dispositions, as well as the mere figures and descriptions of animals, should be informed, that all living creatures cannot be divided into two distinct ranks of wild and tame—as, for example, the horse and the zebra among quadrupeds, and the blue rock pigeon and the ringdove among birds, just as they would separate the red and white men on the chess-board ; but that there is a most perplexing intermediate multitude, neither wild nor yet tameable, but usually spoken of as "familiar" or "half-domesticated," —a term without meaning,—dodging like camp-followers on the offskirts of human society, but determined never to enlist in the drilled and disciplined ranks, playing the game of "off and on," but always ending with the "off." Such are, among many others, the partridge, rats and mice, the house sparrow, the water-hen, and at a still greater distance, I believe and fear, the whole genus of swans proper. Is there nothing resembling this amongst the human race ? The mention of the Gipsy will set thought-capable persons a-thinking. "Oh ! but they have been neglected, uneducated, ill-cared for. Educate ! educate !" say well-intentioned persons, who seem to declare that the soul of man is a *carte blanche*, and who would thereby unthinkingly deny the doctrine of original sin, as asserted by the Church of England. But I have seen enough both of bird and mankind to know, that the heart of neither is a *carte blanche;* —you cannot write on either whatever it may be your pleasure there to inscribe. Your duty in both cases is, to take them as you find them, and make the best you can of them for their interest, which will be found eventually to coincide with your own.

As the sex of the swan is not easily distinguished, and two hen birds will live in affection together, (though two cock birds will not,) "the best rule is, to see the birds in the water, and take that which swims deepest for the female, and that which floats with greatest buoyancy for the male ; remembering that all creatures of the masculine gender have the largest lungs in proportion to their size." The sex of guinea-fowls, which are without distinction to inexperienced observers, are distinguished, our author informs us in another chapter, by the call-note which the hen only uses,— "Come bâck, come bâck," strongly accenting the last syllable. The cock has only the shrill cry of alarm.

II. We now pass on from the ornamental to the domestic poultry, and more practical part, beginning with geese, by a natural transition from swans; for, according to the proverb, "Our geese are sometimes swans," they certainly resemble these aristocratic birds, but with plebeian coarseness. The goose has been the companion of man for a vast portion of time, and the only "really domesticated water-fowl among the ancient Greeks and Romans." The vigilance of this bird has become a matter of well-known schoolboy history. Pliny notices the excellence of the liver of a crammed goose with the zest of a Parisian gourmand; and informs us also that, in some places, geese were plucked in his day twice a-year. Of the domestic goose, our author considers there is but one permanent variety. The age of this bird we know to be incalculably long. Mr Dixon was personally acquainted with an individual of this species, followed by a thriving family, who had seen thirty summers; and there was no reason to suppose that she might not have lived on to double that age. When a goose passes "a certain age," which Mr Dixon's fair friend may be said to have reached, there is no good object to be attained by putting her to death, as her flesh would be no dainty, roasted, boiled, or in a pie; and it is doubtful if broth could be extracted from giblets thirty years in use: and the wonder is, that we do not see more instances of extreme longevity in the goose, which it would be supposed would be often kept, if it were only for "auld lang syne," and as associated with the recollections of bygone generations of men.

Their value and usefulness is scarcely calculable. We omit what is owing to them, as having furnished the most powerful instrument yielded by the hand of man. But in a more material point of view, and reckoning on the very smallest scale, we will suppose that a village green supports only fifty brood geese. The owners of these would be dissatisfied if they got but ten young ones from each in the year, besides eggs: this gives five hundred geese per annum, without taking the chance of a second brood. Multiply five hundred by the number of village greens in the kingdom, and we still form a very inadequate estimate of the importance of the bird: and all this with scarcely any outlay. They are accused of rendering the spots where they feed offensive to other stock; but the secret of this is very simple. A horse bites closer than an ox; a sheep goes nearer to the ground than a horse; but after the sharpest shaving by sheep, the goose will polish up the turf, and grow fat upon the remnants of others: consequently, where geese are kept in great numbers on a small area, little will be left to maintain any other grass-eating creature. But if the commons are not short, it will not be found that other grazing animals object to feed either ogether with, or immediately after, a flock of geese.

We doubt this conclusion; but shall not enter into the discussion of the question. We should like, however, to know the verdict of jury of graminivorous animals respecting it.

Mr Dixon is a benefactor to the rising generations of young turkeys, by advocating a natural and attentive mode of rearing the chicks.

ome books tell you to plunge them in cold water to strengthen them; those that survive will certainly be hardy birds. Others say, "make them swallow a whole peppercorn;" which is as if we were to cram a London pippin down the throat of a [illegible] Others again say, 'Give them a little ale, beer, or wine." We

know, unhappily, that some mothers are wicked enough to give their infants gin, and we know the consequences. Not a few advise that they be taken away, and kept in a basket by the fireside, wrapped in flannel for eight or ten hours. Why take them away from her? She has undergone no loss, or pain, or labour: she wants no rest, having had too much of that already. All she requires is the permission to indulge, undisturbed, the natural exercise of her own affectionate instinct.

In due time, however, they are to be nourished by the hand of man, or more generally by that of tender woman, which, from the force of transmitted habits these three hundred generations, they appear to expect; and then our author would give to the young chick, "the soft crumb of bread rolled into miniature sausages, and for drink milk, not wine. The bird wants material, not stimulant. It has grown all the hours you have neglected it without anything to grow from. Like a young plant in the fine spring season, it will and must grow; but it has no roots in the fertile earth to obtain incessant nourishment. The roots which supply its growth are in its stomach, which it is your office to replenish." This is admirable, both in matter and style, but we have not done with him yet; his remarks a little farther on, when the poults are "shooting the red," are at least equally striking.

"A disease," as some compilers are pleased to term it; being about as much a disease as when the eldest son of the turkey's master or mistress shoots his beard. When young turkeys approach the size of a partridge, or before, the granular fleshy excrescences on the head and neck begin to appear; soon after the whole plumage, particularly the tail feathers, start into rapid growth, and the disease is only to be counteracted by liberal nourishment.

He gives an eloquent character of the maternal turkey.

They are called stupid; but mark the intelligence and amiability displayed by every look and action of a hen with her young. And yet little real alteration of her former manner is apparent. The strut that seemed foolishly pompous, now strikes us as justly proud and cautious: the eye, in which only affectation was apparent, now glances with anxiety, and beams with tenderness. The discordant voice has now an object in its call, and may be heard, almost to a whisper, in subdued notes of gentle affection. Whether in the faithful wife whom we cherish as ourselves, or in the poor bird that we rear, admire, and kill, a higher charm and elevation is added by the exercise of those holy affections which the beneficent Creator of all has given us for our comfort.

The chapter on Domestic Fowl is full of erudite, yet amusing and instructive matter, and of extracts from or references to ancient books—from Leviticus and Deuteronomy, Aristotle and Ælian, to Professor Bell—upon every subject connected with the gallinaceous tribe. As to their origin, Mr Dixon's own opinion is, that the *wild* race of the caste from which they have sprung is quite extinct—gone with other creatures which have retired before the foot of man, unless like the fowls they have submitted to his dominion, as the bustard has disappeared from England, and as the wild turkey will yet probably disappear from North America, and the kangaroo and emu from Australia.

A family of savages would soon consume and destroy a whole province full of

wild cocks and hens, were it never so well stocked; but civilised man can see his interest in their preservation, and it is lucky for fowls that their destiny threw them in contact with the Caucasian race, instead of Australian aborigines. But the increase of knowledge and humanity may even yet do something to extend a merciful and forbearing conduct towards existing animals. . . . . The headquarters of domestic fowl at the present day are, the island of Java, and Sumatra and the Malay peninsula. The prospects opened to natural history by Sir James Brooke's occupation of Borneo, and his gradual pacification of the enormous oriental Archipelago by the suppression of piracy, are scarcely appreciable at this early period. . . . . There is a paradise for poultry fanciers; enough to make one entreat to be admitted into the Sarawâk service as an attaché and volunteer. What delight, in tracking some secluded river, or exploring some lovely valley!—to behold, in the villages, cocks and hens that would here sell for their weight in silver, if not in gold; or perhaps to stumble on unknown pea-fowl and pheasants, a pair of which would draw half Middlesex to the Zoological Gardens!

In one part of the practical portion of this delightful volume, we are at issue with the author. He condemns the system of making capons, which he considers to be getting out of date with other middle-aged barbarisms. He considers the operation as dangerous, difficult, and needless, and pronounces the flesh to be insipid, and inferior to that of other fowls. Now the writer of this notice, who has resided for many years in the north of France, of which the climate is very similar to that of many of the southern English counties, has ascertained that almost every peasant woman can perform the operation without apprehension of failure. An incision is made in the body, near the vent; the forefingers are introduced to take out the genitals, with the aid of a pair of scissors to cut the cord: the orifice is then rubbed with oil or butter, and stitched up, and in three or four days the patient is well. This emasculating process is so common there, that every farmer's wife has ample opportunities of becoming expert at it. A French rural henwife would smile at the notion of a formal pamphlet on the art of caponising, with plates to show the Chinese method of operation, and all the instruments used, with rules for preliminary diet and treatment. We have as strong feelings against the infliction of needless pain on any of God's creatures as the most sensitive of our fellow-men; but in this case, with an experienced operator on dead or living subjects—and why not use chloroform?—we have no hesitation in recommending the revival of a practice by which the weight of poultry—and the quality too—may be so incalculably increased. If capons fetch a high price in the London market, as they undoubtedly do, it is not to be tolerated that the art of making capons should be confined to poultry-keepers in Sussex, Essex, or Herts, as has been the case. If the system be [illegible] become, we hope, of more extended adoption.

[illegible] often assisted in eating the tender and delicious meat [illegible] 7 or 8 lb. weight in Normandy, of a miserable breed [illegible] weight, then, might our Dorkings be brought to attain? [illegible] should a greater sacrifice of life be apprehended from [illegible] of caponising poul[illegible] than from that of emasculating

oxen, swine, or sheep? The difficulty is, however, how to disseminate the art among our rustics. For this purpose, it is not necessary to import foreign artists. There are skilful practitioners among poultry-women within a radius of 30 miles from London, to teach this simple art throughout the kingdom. This is not one of those curious arts which do not bear transplanting. Our forefathers practised it systematically, and though we would protest as strongly as that admirable writer upon poultry, Mr Mowbray, against the infliction of pain—against bungling attempts at the operation to which we are referring—we would encourage, in their efforts, those who undertake the rather difficult and delicate task of persuading our farmers and peasantry to revert to the old usage of making capons.

Instead of having commenced *ab ovo*, we shall *conclude* with the egg, though we have no good reason to assign for altering the order of our course. After informing us that "to every hen belongs an individual peculiarity in the form, colour, and size of the eggs, which never changes"—so decidedly that, "if four dozen eggs laid by four different hens were put at random on a table, the chances are that it would be as easy to sort them as the four suits in a pack of cards"—the author proceeds to confute the notion that "small round eggs produce female, and long pointed ones male chicks," by the following argument:—

> The hen who lays one round egg will continue to lay all her eggs round, and the hen that lays one oblong, will lay all oblong. Consequently, one hen to be the unceasing mother of cocks, another must remain the perpetual producer of pullets, which is absurd, as daily experience proves. Every dairymaid knows, that when a hen steals a nest and hatches her own eggs only, the brood which she brings home contains a fair proportion of either sex. Here is an experiment in point:—An old lady, whose fowls were all white, gave one a small globular egg as round as a ball: it was added to a clutch of speckled Dorkings. The result was the due number of Dorkings, and one white cockerel, which we kept until it began to crow: it ought to have been a pullet, unless the compositor's fingers have been busy in printing one error at least. . . . . Another supposed test is the position of the air-bag at the blunt end of the shell. We are told that, "if it be a little on one side, it will produce a hen; if this vacuity be exactly in the centre, it will produce a cock." But take a basket of eggs, examine them as directed, by holding them between your eye and a candle, and you will find very few indeed in which you can say that the air-bubble is exactly concentrical with the axis of the egg. A cock ought thus to be, like Ovid's black swan, a very rare bird. But in many broods the cockerels bear a proportion of at least one-third, sometimes two-thirds, especially in those hatched during winter or in unfavourable seasons: the immediate cause being doubtless, that the eggs producing the robuster sex possess a stronger vitality; the more remote cause being the same wise law of Providence, through which, in the human race, more males are born into the world than females, to meet the wear and tear of war, labour, and accident.

Mr Dixon knows of no means of determining beforehand the sex of fowls, except perhaps that cocks may be more apt to issue from large eggs, and hens from small ones. Yet we have seen a statement, by an anonymous writer, that a breeder employed by a Mr Storer of Nottingham would select eleven out of thirteen

eggs of game fowl, from which he would engage to produce male birds.*

Columella and Pliny entertained the same notion that long eggs contained male birds, and round, females; but Aristotle held exactly the contrary opinion. "One rule," concludes Mr Dixon, whose book we foresee will go through many editions, "is just as good as the other; that is, good for nothing. When any one will produce a brood consisting entirely of *pullets* hatched from eggs selected with that view, I will allow that there exist *practical* criteria for judging beforehand of the sex of an egg."

Notes on American Agriculture.—(Continued from p. 362.) It is matter of general complaint in the United States, that the government has done, and does so little in disseminating useful information on agricultural subjects. Some, however, consider this as fortunate, inasmuch as it causes private societies to make known improvements with more energy than otherwise they would be inclined to do, if relying upon governmental assistance. "It puts us," remarks a farmer to the writer, "on our mettle." Farmers who were formerly very apathetic in all matters regarding agricultural improvements, begin to see that it is for their interest to endeavour to raise a bushel of corn where formerly they were content with half a one. As in all such cases, competition is doing good, it is astonishing how much benefit one scientific farmer is to his neighbourhood. Apart from all pecuniary considerations, the spirit of emulation raised produces exertions on the part of his neighbours to equal him in his improvements. One or two good farmers, from the best agricultural districts of England and Scotland, have done more to create a desire for good agricultural knowledge in certain districts of the States than any other cause. The result of the last harvest in the United States will also be a great exciting cause to more earnest endeavour in this matter; there has been a great deficiency in the crops, and the somewhat rare event has happened of wheat being quoted at higher prices in American than in English ports.

The following is an instance of what may be considered good farming in America, being the product of 100 acres, the farm of Mr James [illegible], Mount Airey, near Philadelphia, in one season:—

20 tons [illegible] dollars; 400 bushels of wheat at 1.00 dollar; 300 bushels of [illegible] at 80 cen[illegible] [illegible] bushels of oats at 40 cents; 1000 bushels of corn at 60 cents; [illegible]00 bushels of potatoes at 75 cents; 900 bushels of carrots at 40 cents; 600 bushels of rutabaga turnips at 25 cents; 600 bushels of sugar beets at 40 cents; 1500 bushels of turnips at 12½ cents; 15 hogs, 45 cwt. of pork, at 5 dollars; cattle, calves, [illegible]d pigs sold, 347 dollars; net sales of milk and butter, over 1500 dollars. Total, [illegible]25 dollars 50 cents. Stock kept, 50 head of cattle, 7 horses, 30 swine. Paid for labour during the year, 1,000 dollars. Sixty-seven dollars' worth of produce for every acre of the farm, and fifty-seven after paying for labour—a sum much above

[illegible]

the average price of land per acre in Pennsylvania. Mr Gowan has great advantage in being near a large market, (*though there are thousands of farmers as well situated in this respect who do not produce one-fifth the quantity on* 100 *acres;*) but the enormous amount of produce above stated affords a striking proof of what may be done by wisdom in planning, and perseverance in executing.

The following are Mr A. W. Franklin's statements of profitable and unprofitable farming. The prices mentioned will be interesting, as affording a means for comparing them with the prices here.

We take the article corn for illustration, (although the principle will apply to every other product,) because it is the great staple of grain agriculture, and a magnificent vegetable. We doubt whether the luxuriance of the tropics can present a more pleasing sight than a rich field of growing maize, with its forest of dark green foliage: and teeming with the promised harvest. We are the more proud of our country that can claim this plant as a native of the soil. Statement of the cost of cultivating two fields of corn, and the quantity produced in each :—

No. 1, Dr.

	Dol.	Cents.
Interest on 2 acres of land worth 50 dollars per acre,	6	0
50 loads of manure, at 25 cents (1s.,)	12	50
Spreading the same, 1 day's work, (3s.,)	0	75
Ploughing and harrowing, 3 days,	4	50
Ploughing second time, 2 days,	3	0
Furrowing and drilling 25 loads of manure, and planting, 6 days,	9	0
Manure 25 loads at 25 cents,	6	25
Seed 50 cents, (2s. 1d.) ploughing and hoeing twice, 10 dollars,	10	50
Expense of gathering,	5	0
	57	50

Cr.

By 90 bushels of corn per acre at 75 cents,	135	0
Corn fodder and manure made,	20	0
	155	0
Difference,	97	50

No. 2, Dr.

	Dol.	Cents.
Interest on 2 acres, worth 15 dollars per acre,	1	80
Ten loads of manure at 25 cents,	2	50
Ploughing and harrowing, 2 days,	3	0
Planting, 4 days, 3 dollars ; seed 50 cents,	3	50
Ploughing and hoeing, twice,	7	50
Expense of gathering,	3	0
	21	30

Cr.

By 15 bushels of corn per acre, 75 cents,	22	50
Fodder and manure made,	5	0
	27	50
Difference,	6	20

Little manure, much labour, little crops, little profit. This system, No. 2, practised on a large scale, say 20 acres, would assuredly make a much larger difference, but it would be on the wrong side. If No. 1 had spread his manure at the same rate as No. 2—viz. 5 loads to the acre—he would have cultivated 15 acres ; still the better quality of his land might have overbalanced the extra labour required, and saved him a profit. If No. 2 had put all his manure on one-fourth of an acre of land, and

cultivated it with as much care as No. 1, he might have obtained as large an amount of produce in proportion to the value of his land, and saved more than three-fourths of his labour and expense.

The gentleman who has furnished these tables says, that he is convinced from experience, and from his own observation of the tillage and crops in various sections of the country, that there is an amount of human labour, and wear and tear of cattle and implements, thrown away on every one of the *old States every year* upon poor crops—sufficient to build a railway, or construct a canal across the state. By labour, he means the useless toil of running over five or ten acres of ground for a crop, which, by proper management, might be produced on one.

The reader will doubtless be struck with one thing, in perusing the evidence we have given illustrative of the increased and increasing attention given to good cultivation in the United States. This is, if there has been in bypast years such a large surplus of their crops left for exportation to this and other countries—obtained, be it remembered, by defective farming—what must be the result in this respect, of good scientific cultivation? The answer is obvious: from it will the British farmer perceive that it is his closest interest to look well to his doings, to take advantage of every improvement made known in his important calling.

Before proceeding to the consideration of other matters, we here append one or two important statistical statements relative to the condition of agriculture in some of the oldest States. The first is that of New York. There are fifty-nine counties in that state: the population is 2,604,495; the number of acres taxed 27,726,549; and the aggregate valuation 616,824,955 dollars. The agricultural counties are the wealthiest, and the rate of taxation very low. The poorest portions are the heaviest taxed. From the late census, it appears that the following was the amount of crops raised, and the average produce per acre. The latter may, however, be considered as too high:—

	Number of acres.	Bushels raised.	Average per acre.
Barley, ...	192,503	3,108,704	16 bushels.
Peas, ...	117,379	1,171,503	15 ...
Beans, ...	16,231	162,187	10 ...
Buckwheat, ...	255,495	3,634,679	14 ...
Turnips, ...	15,322	1,350,332	88 ...
Potatoes, ...	255,162	23,653,418	92.7 ...
Wheat sown, ...	1,013,665	13,391,770	13.5 ...
Do. harvested, . .	958,234		
Corn, ...	595,135	14,772,114	24.8 ...
Rye, ...	317,099	2,966,322	95.5 ...
Oats, ...	1,026,915	26,323,051	26 ...
Flax, ...	46,089	2,897,062 lbs.	62¼ lbs.

... the state is 11,757,276, only

little more than one-third of the number of acres taxed. Number of neat cattle 2,072,330; cows milked 999,490; butter 79,501,733 lb.; cheese 36,744,976 lb.; horses 505,155; sheep 6,443,855; fleeces 4,607,002; wool 13,864,828 lb.; hogs 1,584,344.

In Pennsylvania there are fifty-eight counties. Population, in 1840, 1,724,033; number of acres taxed 28,198,380. The value of agricultural produce of the state of Massachusetts, in 1845, was 23,192,703 dollars, and of this some ten millions and a quarter may be taken as the value of the live stock. The whole amount of the results of other labour, and the employment of capital, was 124,735,264 dollars—showing greatly in favour of other articles produced over agricultural produce. But it should be remembered that Massachusetts is one of the principal of the manufacturing states in the northern part of the Union. The number of cattle in the year alluded to was 276,549, the value 5,327,199 dollars. The value of 65,181 horses equal to 3,451,118 dollars; 354,943 sheep, value 558,284 dollars; 104,740 swine, value 917,434 dollars. The value of the grain 2,228,229 dollars; hay 5,214,357 dollars; potatoes 1,309,030 dollars; butter 1,116,709 dollars. Ohio is remarkable for its rapid growth, both as regards population and wealth. Fifty years ago, the population did not exceed 20,000, "consisting of a few hardy pioneers toiling in an almost pathless wilderness; now the population is nearly 2,000,000, and their accumulated property 500,000,000 dollars—the third, if not the second, state in the Union." The valuation of the taxable lands and buildings, in 1847, was 259,093,635 dollars. Horses 15,005,263 dollars; cattle 7,572,172 dollars; and sheep 1,758,438 dollars. As a means of comparing the agricultural wealth of the New England or Northern States with those of the South, and as a slight contribution towards the consideration of the question which has been so often mooted, "How could the Southern States do without the Northern?" we give the following:—

The States of Maine, Massachusetts, New Hampshire, Vermont, Connecticut, and Rhode Island, have a population of 2,422,000. The States of Georgia and Tennessee have enjoined a population of 1,694,000. The relative products, according to the census of 1840, showed the following:—

	New England.	Georgia and Tennessee.
	Bushels.	Bushels.
Corn,	11,943,000	83,585,000
Wheat,	2,898,000	9,911,000
Potatoes,	20,582,000	3,792,000
Rye,	2,582,000	448,000
Oats,	11,247,000	9,458,000
Buckwheat,	1,097,000	
Total,	50,348,000	107,194,000

In addition to this, Georgia and Tennessee produce annually about 15,000,000 lb. of rice, and probably 3,000,000 bushels of sweet (Carolina) potatoes, *none* of which are raised in New England. They also have, according to the census of 1840, 1,906,851 neat cattle, and 4,484,362 swine; whereas, the six New England states have but 1,545,273 neat cattle, and only 748,698 swine.

This state of matters explains the fact why living, provisions, &c., are so cheap in the Southern States; and from this may be seen the advantage those states will have over the North in commencing manufactures. Labourers and operatives could live one-half cheaper at Georgia or Tennessee than at Lowell. Great efforts are making in the south to establish manufactures.

In scarcely any department of cultivation has there been such a decided improvement as in that of fruit. At present, throughout the whole Union, there is quite an excitement in the object of raising fine fruits. Numerous societies have been formed for the purpose of giving encouragement to cultivators, and not a few of the pages of the agricultural papers are devoted to accounts of improvements, and of new fruits raised. It is the general opinion that the time is not far distant when the export of fruit will exceed in amount (that is to say, if there is a demand for it) that of any article of export. The following is an account of the old-fashioned mode of proceeding in planting orchards:—

The enterprising farmer who concluded to plant an orchard, would go to a tangled swamp of young apple trees called a nursery, in one corner of his own or his neighbour's mowing field, where, eight or ten years before, a load of pomace from the cider mill had been scattered and ploughed in; and, after a good deal of labour in hewing away the underbrush, be able to select his trees. The selection consisting in choosing straight handsome trees, the fruit was of course all guess-work. The tools employed in taking up the trees were, a hoe to clear the surface, an axe to chop off the roots, and a pair of oxen and chains to tear a stubborn tree from the ground. With the roots and bark all torn and mangled, they were thrown loose into a cart, carried to the site of the future orchard, tumbled on the ground, for the full action of the sun and wind. Then, or perhaps next day, commenced the operation of "setting in." With a hoe, and sometimes the aid of a shovel or spade, holes were dug nearly the shape and size of large milk-pans, into which the roots were thrust, and doubled and twisted, then the earth thrown in and rammed or stamped till it was hard. We have known men of good sound sense, and good judgment in common matters, practise this within our recollection (and the number of stunted, scraggy, consumptive orchards in all parts of the country is conclusive proof of our statement;) and we doubt not the same mode is still in vogue in some, if not all the States, at the present day.

We need not say that this unscientific slovenly mode of operating is fast becoming unfashionable. It is another proof of the great carelessness of American farmers. The West is becoming, to use the words of [illegible] American writer, "fruited" with fruit trees. It is curious and [illegible] to think of hardy races of settlers, clearing these lands [illegible] called the unproductive natural growth of trees, just [illegible] for a second covering of timber, teeming every [illegible] fruits. On this point the Rev. M[illegible]

[illegible] 20,000. The first settlers carried with them the seeds of fruit trees and these were nearly all that the State produced until the last 10 years. Now look at the present enterprise on this subject, and the future prospect. During the past year (1844) there have been planted in this State at least 100,000 apple trees. Every year the demand increases, and our farmers are increasingly zealous in pear cultivation. A few years ago, to each 100 apple trees, our nurseries sold perhaps two pear trees, now they sell 20 to [illegible] our nurseries have not

been able to answer it, and they are swept almost entirely clear. Apple trees not under *ten feet high* sell at ten, and pears at twenty cents, (5d. and 10d. each ;) in some nurseries apples may be had at six cents ! ! (three pence.) During the season of 1843-4, apples of the finest sort sold at my door, as late as April, for 25 cents (one shilling) *a bushel*, and dull at that. The effects of such a deluge of fruit is worthy of some speculation. Fruit will become more generally an article, not of luxury, but of ordinary diet. A few years, and the apple crop will become a matter of reckoning by *farmers* and speculators, just as is now the potato crop, the wheat crop, &c. Nor will it create a home market alone. By care, it may be exported with such facility that the world will receive it as part of its diet. Nor, if I inherit my threescore years and ten, do I expect to die until *the apple crop of the United States shall surpass the potato crop in value.* It is a permanent crop, not requiring annual planting ; and it produces more bushels to the acre than corn, wheat, or on an average, potatoes. The pear and the apple are to hold a place yet as universal eatables—a *fruit grain,*—not known in their past history. Without planting another tree, this county (Marion) will in ten years produce 200,000 bushels of apples. Suppose the 90 counties of Indiana to have only 25 trees to 160 acres of land, the crop of 15 bushels to a tree would be nearly 2,000,000 of bushels.

To judge of the value and importance of this crop to the agriculturists of the States, it must be remembered, that what we have been describing as the flourishing condition of only one State is but the type of others. In the Northern States there are numberless orchards, not only of pear and apple, but of peach and other fruit trees. "There are peach orchards in New Jersey and Delaware occupying upwards of a hundred acres each. There is one at Reybolds covering a thousand acres. The crops of this latter orchard are so large as to give constant employment to two steamboats and a schooner in conveying the fruit to market." And attached to almost every farm there is a large or small orchard. One of the most striking curiosities of New York, in the fruit season, is the various steam and sailing boats bringing their freights to the market. Last year we frequently went to the markets, and were abundantly repaid for the trouble. We certainly never expect to see such a gorgeous display of fruit again. As might be expected from the statements we have given, fruit is everywhere cheap. Peaches, large, luscious, three a-penny of our money; some particularly large, one and two cents, sometimes four cents a-piece—the latter would have been charged a shilling or two here. The crop of apples was last year considered a failure, and yet we have bought three beautiful ones for a cent. No one in this country can have an idea of the amazingly rich flavour of some kinds of American apples. Those so highly prized here, as real Americans, convey no idea of the best quality of fruit to be obtained for a mere trifle in the fruit-growing States.

In noticing some of the peculiarities of American farms and farming, one cannot fail to be surprised at what has been termed the "horrible slovenliness" of American agriculturists generally. And first as to fences. They may truly be said to be of the rudest description. So far as we can recollect, we did not see a real good-looking English fence during our visit, and we have been in the best agricultural district of the State of New York. We will

describe one very favourite form—we may call it the zig-zag fence. A number of wooden rails, or pieces of scantling, no matter how rough and crooked they may be, are first obtained. One rail is laid in the ground, then another is laid so as to form an angle with the first one, its end resting on that of the first. A third rail is then laid on the end of the second and forming an angle therewith; and the same is done with a fourth rail, and so on. Other loose rails are laid upon them, until a proper height is obtained: this is generally four or five feet. The whole forms a peculiarly unstable-looking fence, but it is in reality very strong, and capable of resisting considerable opposing force. The whole is upheld without the assistance of a single nail, or other fastening. It is this peculiarity, doubtless, that has caused it to be adopted. It is, however, obvious that, in its construction, a vast quantity of wood is uselessly expended. This, however, is of little moment in the interior, where wood is so plentiful. The farmers are very fond of this species of fence, ugly and cumbersome as it is. "So stupidly attached to this form of fence are some old people, that when they build wall fences they build them in and out, in the same zig-zag way they have been accustomed to do their rail fences." As may be supposed, the gates in farms are quite in keeping generally with the rudeness of the fences. Posts are driven in, on either side of the gateway; and in the inside of these, holes are cut at equal distances; in these holes rails are inserted—of course loosely—all of which have to be removed when a cart, for instance, is required to pass through. Regularly hung gates are sometimes used: these are, however, rude enough in their construction. "To balance a gate, you will see the topmost piece of timber extended five or six feet over the post to which it is attached. On this piece of timber you will sometimes see a trough filled with stones, while at other times a huge piece of wood is attached." It is needless to say that, in all well-conducted farms, the fences, &c. are admirably constructed and arranged. This unfortunately is the exception, not the rule. But the fences and gates are not the only things unpleasing to the eye of a scientific farmer. The appearance of some of the fields of a comparatively new tract of land is peculiarly odd. On clearing land the trees are cut down, some three feet from the ground: the stumps thus left are allowed to remain in the ground till they utterly decay. They are generally black and scorched looking: this is owing to their being burnt, which prevents vegetation from proceeding after the trees are cut down. This, as may be judged, has a tendency to preserve the wood for a much longer period than otherwise would be the case if allowed to remain unburnt. One enterprising farmer told us that he never burnt the stumps, but allowed them to rem[illegible] decay naturally. The period taken in such cases is [illegible] when charred, much longer. The stumps thus left, [illegible] and charred, present a curious appearance

when they peer up amidst the green herbage surrounding them. A stranger, at first sight, is exceedingly apt to take them for diminutive cattle, or black sheep, scattered over the field. The following is a description of land in the very best farming district of New York State, the far-famed Genesee county. We give it here, as it forms an admirable description of the slovenly confusion too often seen in the neighbourhood of farms. We have toiled through such a place, in the heat of summer, within gun-shot of a farm-house belonging to a farmer who was considered quite a scientific agriculturist. "Weeds, and rough-looking grasses, and fallen trees, which seemed to have been rotting for ages; old stumps, some black and half-burnt, others grey and half-rotten. Trunks of trees, some ten, some twenty or thirty yards in height, some rotten and ready to fall; some sound, and some strong; some black and half-consumed by fire, some crumbling to pieces by decay, some split, some hollow, some fallen, some standing; some with their roots pulled up, but most with their roots in the ground; some amidst the grass, some in the orchards, some amidst the corn." Fancy such a scene and condition of affairs on an English farm!

The agricultural implements in the United States are much lighter in construction than in this country, the ploughs particularly so. These are well adapted for the peculiarities of the land. It would be impossible to plough land recently cleared, with all the stumps and roots scattered here and there, with the heavy ploughs of this country. It is astonishing to see how easily the farmer turns aside from the stumps; and even should he fall foul of one, the plough is so light, that he can *fillip* it past the obstruction very easily. Old Country farmers are disposed to find fault with them, but they are soon taught to perceive that they are very well adapted to the kind of labour they have to perform. With reference to other implements, the same rule holds. The hay-forks are amazingly light and handy: a young boy can easily use them. Scythes, hatchets, &c., are all made exceedingly light and portable, and in this we think the Yankees show real wisdom. There is no real utility to be gained by having huge heavy instruments to deal with. A farmer who had had, both in this country and in America, much experience as a hard-working man, told us that the result of his experience was, that more work could be done in the same space of time, and with less of fatigue, with the Yankee tools than with those of this country. The axes used for felling trees are very light: we must confess that, at first sight, we thought that heavier heads would have been better; but a sight of the execution they performed in good hands, on the sturdy sons of the forest, soon showed us our mistake. The "horse rake" is almost universally used for gathering the hay off the fields, and forming it into "cocks." There is scarcely such a thing as reaping corn by hooks, as here performed, the common scythe, or more generally the

cradle-scythe, being used. It is astonishing how much one man can cut down in a day. There is great rivalry in this point amongst farm-servants. Oxen are invariably used for farm purposes, carting of hay, &c. Some of these animals are really wonderfully well paired. A friend of the writer's had a pair so beautifully matched, so alike in every respect—colour, size, and even shape and length of horns—that it was difficult to distinguish between the two. The same farmer had a young pair which he was rearing for the purpose of exhibiting at the great State fair: their colour was pure white. We believe he gained the first (or one of the first) prizes for well-matched oxen. Farmers vie with one another in rearing handsome well-paired oxen. Much more attention is paid now than formerly to the rearing of stock. The cow-houses are all constructed of wood, and have arrangements for feeding and housing, very peculiar. In the centre of the house, there is a division railed off on each side: on this walk or central alley the fodder is placed. The cattle are ranged on either side. By lifting up pieces of wood, placed in these rails, space is made for allowing the animal to insert its head and neck, so as to partake of the fodder within the inner division. The piece of wood is let down, thus confining the neck and head of the animal in one position till released. The cattle seem to have no objection to this kind of restraint. The horses are invariably slender, and at first sight a European fancies that they are too much so to do much heavy work. This is not the case: they are high-spirited, and capable of undergoing much fatigue. They are used for all kinds of work: no such thing being seen, so far as we remember, as horses kept for one particular kind of jobbing. After a hard day's work in the field, the spirited animal is glad to have a run of ten or twelve miles harnessed to a "buggy," conveying perhaps the younger branches of the family to a "frolic" in the neighbourhood.

The farm-houses are generally made of wood, placed in some cases in low stone basements to protect them from the damp. They are commodious, and generally well arranged: the kitchen is always the largest apartment in the house. The most striking external peculiarity of American farm-steadings is the long range of wooden outhouses, and the entire absence of all appearance of grain, &c. The former is caused solely from the fact that the corn, hay, and in fact all crops, are housed, not made up in stacks as here done. This custom necessarily requires large and commodious outhouses to be constructed.

As may be supposed, vegetation proceeds very rapidly. In the Northern States, though the winter can scarcely be said to be broken [illegible] April, barley is generally ready to be cut early in [illegible] ready towards the end of the same month. Oats are r[illegible] Indian corn in September; and the buck-wheat [illegible] the corn. It is scarcely an exaggera-

tion to say that, after a slight shower during the night, succeeded by a fine sunny day, you see the crop growing. Certain it is that, measuring barley stalks in the morning, you will find in the evening no mean addition to their length. This rapidity of growth causes the crop of oats to be generally a poor one: it grows so rapidly, that there is no time for the grain to fill properly. A farmer in the State of New York informed us that, with all his care, and in spite of all his knowledge of the crop, (he had been a Scotch farmer,) he could never depend upon a good return. And yet his meal was fast getting into repute. The Americans are generally fond of oatmeal: indeed, it fetches a high price; but yet the supply is exceedingly defective. Indian corn is the staple commodity of American farms: it is used in all kinds of ways. One variety is taken in its green state and boiled. Its flavour is remarkably fine, and resembles very much that of green pease. Judging from our own experience, we should say that it would take some time for a European to relish the vegetable: it is too sweet and rich for all tastes. The Americans are amazingly fond of it. Indian corn is sown in what is called "hills." Some species grow very high; we have seen stalks ten and twelve feet in height. It is a noble-looking plant. The varieties are very numerous. Dr Brown of Philadelphia enumerates upwards of forty kinds. The editor of the *Maine Cultivator* says that it would be an easy task to make out sixty varieties. The growing capabilities of the various species differ very much. Some spring quickly up, and soon ripen; others spring up more slowly, and ripen later. Some have six or eight rows of grain in the ear; others have as many as twelve and fourteen. In some, the grains are all of one colour; in others, variegated—yellow, mixed with red, scarlet, purple, and black. These are, however, very small. Indian meal is much relished throughout the States. Indian meal porridge, or "hominy," as it is there called, is very delicious, when taken with new milk. Pumpkins are generally grown between the "hills" of Indian corn plants: they require very little tending, and grow to an immense size. A yard, and even a yard and a quarter, is no uncommon size to be found. These pumpkins are wholesome and nutritious food, both for man and cattle. "Pumpkin pie" is considered a great treat. Rasp and brambleberry trees grow in great abundance in the woods. We have wandered for miles through a wood, and have been surrounded with berry-bushes. We recollect once of emerging upon a cleared space, which had been cleared some ten or twelve years before, and which had an undergrowth of berry-bushes so thickly set, that the plentiful crop of red raspberries gave a decidedly red hue to the surrounding space. They are small, but rich and luscious. They are gathered in large quantities, and boiled with a little sugar, and partaken of largely by the farm-servants at almost every meal. Nothing can surpass the beauty

of the hanging clusters of wild grapes to be found in the woods. In some places they are amazingly plentiful; above and around, on all sides, the graceful pendants are seen. They are, however, very small, and exceedingly sour. By careful cultivation, they attain to a larger size and finer flavour. Farmers are beginning to see the importance of their cultivation: they are easily reared, requiring no great care. In the State of Ohio, the hazel-nut trees are found in the woods in amazing quantities. They grow very low, not much higher than our gooseberry-bushes; but they are very prolific. In every district where there is plenty of wooded land, there are numerous varieties of wild fruit-trees bearing wholesome fruit—such as cranberries, elderberries, and winter gooseberries. The elderberries are of a much finer quality than those in this country. Apples for domestic use are first peeled or pared, (by a machine in most cases,) and cut up into four or six pieces, and strung upon ends, and hung up to dry. They keep for any length of time. By putting these dried parts of apples along with a little boiling water and sugar, a delicious dish is readily obtained, equal in every respect to stewed apples.

The wages of farm-servants vary in different States and localities. We here give a statement regarding them. In a large State, such as New York, wages will vary considerably in different sections: the average is endeavoured to be given:—

	Per day. cents.	Per month, dollars.
Maine, New Hampshire, and Vermont, . .	62	12
Massachusetts, Rhode Island, Connecticut, .	75	12 to 15
New York, ...	50	10 to 12
New Jersey, ...	75	12
Pennsylvania and Ohio, ...	50	10
Maryland and district of Columbia, (White,) .	50 to 75	10
* Virginia, North and South Carolina, Georgia, Kentucky, and Tennessee, (White,)	50	10 to 12
... ... (Coloured,)	25 to 40	5 to 10
Alabama and Mississippi, ...	25 to 30	12 to 15
Louisiana, Florida, and Arkansas, . . .	50	15
Indiana, Illinois, and Michigan, . . .	50 to 75	8 to 12
Iowa, Wisconsin, and Missouri, . . .	75 to 91	10 to 15

"The States marked thus * are grouped together, as they present very similar features of position and distribution of population. They all embrace lowlands and highlands. In the former, slaves perform nearly all the manual labour; in the latter, there are comparatively few slaves, and white labour predominates. In the [illegible]able, the wages of each are consequently given. In the States [illegible] south-west, labour is nearly all performed by slaves, but is [illegible] [illegible]uable, because more productive, arising from greater fer[illegible]ity of soil." With regard to wages, or at least as to the quan[illegible] of provisions the same amount will purchase in the old States [illegible] new, there is a remarkable difference. In the western [illegible] necessaries [illegible] ife [illegible] but hal[illegible] cost of the same in

the New England States. Thus in Indiana or Missouri, two dollars and a half (a week's wages) will buy a barrel of flour, or twelve bushels of corn and potatoes, or 100 lb. of pork; while in Massachusetts, three dollars (a week's wages) will buy only half a barrel of flour, or four bushels of corn, or six bushels of potatoes, or fifty lb. of beef or pork. Emigrants from England and Ireland make a sad mistake in seeking work in America as farm-servants—which is in asking too high wages. On this point the *New York Tribune* has the following excellent remarks:—

The first idea of a European landing here, and seeking work, is high wages. He does not consider that he is utterly unacquainted with our implements and modes of doing things; that he can seldom plant, or mow, or fence in *our way*, nearly so fast as a born Yankee: he sees only that a Yankee gets twelve or fifteen dollars per month for farm-work, and he insists upon having so much. But he cannot go forward and do as the Yankee does: he can hardly keep up with him when placed beside him; and, however athletic and faithful, his services are not worth so much per month as the Yankee's. . . . Suppose he can get but seven dollars a-month on a farm, while the Yankee who works beside him gets fifteen—let him never mind the disparity, if he has a good chance of learning our American ways of farming. That is the great point. Let him learn to do as we do first, and improve on our ways as much as possible afterwards. A single year will suffice, if he be docile and observing, to give him dexterity in our ways. After that, he will be equal to any American, and may command as good wages, *possibly better, as he will understand many Old Country ways which, in their place, are superior to ours.* We may here give the average rate of the following trades, generally in demand in the agricultural districts of the States. A day-labourer, one day's labour, 1 dollar; carpenter, 1 dollar 45 cents; mason, 1 dollar 62 cents; farm hands, 9 dollars per month; servant-maids, 1 dollar 25 cents per week. In all these the wages are considered as inclusive of board. This varies more than labour in different sections of the country. In New England, two dollars per week is a fair average of a labourer's board: in the Western States, one dollar. During the short season of harvest, labourers will command one-half more wages per day in all the great agricultural districts.

The style of living in American farm-houses is very patriarchal. The farmer and his family rarely, if ever, dine or take their meals by themselves; the farm-servant always sitting at table. At a farm-house there is no distinction of persons: the visitor, of whatever class or station of life, must sit down with the farm-servants, and the "help" of the family in general circumstances; and the same attention is paid to all. The living is very good, plentiful, and wholesome. Immense quantities of butter are made use of. We were surprised to see farm-servants eat butter, in no measured quantity, along with fat pork. The hours of farm-servants are very long. In the summer-time work is generally begun at four o'clock in the morning; breakfast taken between seven and eight; work till twelve; dinner, a half an hour or so for resting; then till six, tea; and the labours of the day are finished by milking the cows and attending the cattle. It is generally near eight o'clock before the day is fairly finished. The farm-servants have thus little time left to themselves. If they are inclined for amusement, they may have it: a ramble in the woods, a game at quoits, seem to be the most favourite mode of amusing themselves. As a general rule, farm-servants are a very sober, quiet, industrious

class,—rarely spending their time and money in public-hou needlessly. A sober and industrious man has a fair cha saving as much money, in the course of twelve or eighteen n as may enable him to "go West" and purchase a small lot c "The American labourer, if frugal and temperate, may ha own *lot*, and house or cottage, and good furniture in it. aid of his cow, his garden, female industry, and good manag he may save his wages entire." Many eminent profession and statesmen have had just such a humble beginning; and majority of wealthy farmers have begun in a similar positic great help to parties with small capital is the facilities giv the purchasing of land. In very few cases, indeed, is the pu money at all demanded. The general way of doing bus paying by yearly or half-yearly instalments. Where the pu money amounts to four or five thousand dollars, the tim extend over a period of six or seven years. Credit is univ given: farming tools and seed, &c., can be got on easy terms here append one or two instances, showing the price at which partially cleared lands may be obtained in agricultural di For a farm of 92 acres, the price was 1700 dollars, or about On the farm there was a large and commodious house, extensi buildings, barns, &c. Of the 92 acres, about 80 were c In the wooded portion are beech, hickory, walnut, but chestnut, and other trees; besides abundance of grapes, p alderberries, blackberries, rasps, &c. The orchard is some a extent, all the trees bearing delicious fruit. There is a c running stream running down the centre of the farm: a many excellent springs. A canal passes through the esta a river bounds one end of it. With all these natural and a advantages, such an estate could not be got in this country than three or four thousand pounds. The whole of the taxes and local, amount only to £3, 10s. per annum. No. 2. A f 164 acres; 60 acres in wood, the remainder cleared; a superior house; the stables, cow-houses, granaries, &c., in fi condition, and the arrangements admirably made; price dollars, or about £1200. This may be looked upon as rather nevertheless, from the admirable arrangements of the building good condition, the richness of land, and beauty of pasture, considered cheap. No. 3. 209 acres; 100 acres well w excellent house and out-buildings; plentiful supply of price £4 per acre. No. 4. 6 acres; about one-third of an ac out as a garden, 4 or 5 acres in fields, the rest in wood; pl water, and well situated; a commodious house, with standing £75. Parties can get uncleared land prepared for cultiva a cheap rate. Men are easily found who are willing to cl timber, and give a sum per acre for it into the bargain. varies from 7 to 11 dollars.

It is worthy of remark, that the real American farmer is amazingly fond of change: he may be said to be always emigrating, never settling. However comfortable he may be, he is always contemplating the possibility of being off, sooner or later, to other "diggins." An offer of cash down will decide him at once: he will soon strike a bargain and be off. Often as they change, they are "cute" enough to change always for the better. Americans are considered to be the best original settlers: they seem to have an aptitude for clearing land. On the other hand, they fail generally in improving lands, probably from the want of trying, or the requisite knowledge. English farmers make poor original settlers, but they almost invariably succeed in improving cleared, or partially cleared lands. With reference to uncleared lands, its quality may be judged of by the following rules, given by an American Hand-Book: "Throughout the northerly portion of America, land which is timbered ought to have growing upon it tall and strong hard timber, such as the maple, elm, basswood, cherry, hickory, white ash, butternut, and the like. If the land in which any of these kinds of timber is found is dry, as it usually is, the land is good land. The trees should, as a general rule, be tall, and branching only near the top. The land which bears the timber we have now named, or some kinds of it, is sure to be good."

The roads leading from the farms to the villages, and even to the large towns, are very badly constructed: they are really, as a Scotchman gravely remarked to the writer, "awful." In summer the quantity of dust is positively amazing; in winter the mud is equally striking. In the "fall" and "spring" seasons—that is, at the beginning of the rainy seasons, and the breaking up of the winter—they are sometimes almost impassable. A farmer informed us that, having occasion to go to a mill some two miles distant, it took him nearly three hours, and his horses were quite exhausted with their efforts. In districts sufficiently populous to pay for their construction, a species of road is laid down, called a "plank road." These roads are excellent contrivances, and facilitate the communication between farms and market towns very much. Although they are of comparatively recent introduction, immense tracts of country are laid with them. They are supported by tolls, those in the state of New York demanding six cents (threepence) for a single-horsed gig or buggy, for a run of eight or ten miles. The mode of laying them down is very simple, and may be briefly described:—The line of road is marked out and levelled as much as possible. As they are generally laid down in the track of roads previously made, the centre is raised, leaving a hollow on each side, into which the water may run off from the planks through small holes or drains. A track little broader than the breadth of a coach or waggon (if for a single line) is marked out; and on each side

of this, planks some 8 or 9 feet long, 8 inches broad, and 3 thick, are laid parallel thereto. These are laid end to end, thus forming a double line of planks along the road. On the top of these side-supports, the planks on which the carriages run, forming the road-way, are laid: these project a little beyond the side-supports: they are generally some 10 or 14 inches broad, and 2 or 3 thick. The side of the embankment is brought up so as to cover the ends, and the road is complete.

Land in the West is generally what is called "prairie," being grassy, and not wooded. The soil is amazingly tough. It takes from three to five yokes of oxen, and a large heavy plough, to break it up, one man driving, the other holding. Two acres per day may be broken up—the average cost of each acre being one dollar and a half. The breaking up is generally performed about May or June; if planted with Indian corn a good half crop may be obtained. Wheat may be put in at autumn; or, if delayed till spring, it will be in fine condition for corn.

A sod crop is raised as follows:—When breaking up the sod, corn is dropped in every third or fourth furrow, close to the right or outer side, and is covered by the next furrow. It springs up and grows: no hoeing is needed, and frequently a crop of 30 to 60 bushels is produced. If put in early, this crop will come off in season to harrow in a crop of wheat, which is done without any further ploughing. Land in the Far West is very cheap: 1 dollar 25 cents per acre is the Government selling price, 160 acres from which is called a quarter section: 40 acres of public land is the minimum quantity that can be purchased. Farms ready for cultivation may be bought near markets at prices varying from 10 to 15 dollars per acre, but plenty of land may be had on condition of giving one-half of the three first crops, or according to bargain. The following will show the general rate at which farms may be purchased, and made ready for cultivation:—

	£	s.	d.
A quarter section of prairie land, 160 acres at 5s.=1 dol. 25 cents,	£41	13	4
Timber, say 40 acres, (generally found at the borders of streams,)	25	0	0
Breaking up the sod at 6s. per acre, say, ...	50	0	0
Fencing into four lots, 8 rails high, and stakes, 960 rods, in 3 miles 15,366 rails at 1 cent, and 153 dollars 57 cents, 3840 stakes at half a cent, 19 dollars 20 cents, ...	36	0	10
A comfortable log cabin, such as settlers first occupy, . .	10	8	4
Other small buildings, ...	10	8	4
Cost of a well, with pump and buckets, ...	3	2	6
Garden, cow-yard, hog-pen, and other fittings, . . .	15	0	0
	£191	13	4

ESTIMATE OF FARMING IN WISCONSIN.

Cost of 2[illegible] acres prairie land [illegible] dollar 25 cents per acre, .	250 dol.
Fencing [illegible] . .	400 –
Breaking u[illegible] . .	480 –
Seed [illegible] . .	160 –
[illegible] . .	400 –
	1690 dol.
[illegible] .	2200 –
[illegible] .	510 dol.

[illegible] the land being fenced and the land subdued, a crop of 3500 bushels can be raised [illegible] less than [illegible] dollars.

The following is the Hon. Mr Ellsworth's statement regarding the mode of farming, as practised in Indiana :—

I was offered 16 bushels of corn as rent per acre instead of one-third of the crop, which is the usual share for the landlord. I preferred, however, the one-third, and got 20 bushels, the season being very favourable, and the land yielding 60 bushels, and some as high as 80 bushels per acre. 50 bushels is a good crop, and, when the hazards of the season are considered, 16 bushels per acre may be called a good rent. With this conviction, I have rented 1000 acres of ground for 16,000 bushels of shilled corn, delivered in the crib. . . . While corn is so easily raised, it may be asked what is its value ? At present, (June 1, 1846.) the price at Indiana on the Wabash, about midway between Cincinnati and Chicago, is about 20 to 25 cents the bushel for exportation to New York, by the lakes and canals, or to New Orleans by the Ohio and Mississippi. But most of it is consumed in fattening hogs and cattle as follows—in the mode of feeding cows there is a diversity of practice :—Some graziers turn both cattle and hogs into the field, to consume what they wish. The fat cattle and fat hogs are first admitted, and follow each other; then the store cattle and store hogs. Hogs will not pull down corn faster than they wish to eat it. Cattle do more injury, yet the hungry hogs will glean up most that falls on the ground. I have serious doubts which is the most advisable mode—whether to cut the corn and feed it, to stack in pens, or to let them consume it in the field where it grows. The usual mode, however, is to cut up the corn, stack it, and feed it out. I have been able to hire land with a corn crop on it at 2 dollars 50 cents to 3 dollars per acre, the average yield being 50 bushels. The cost per bushel standing in the fields is about 5 to 6 cents only, exclusive of the rent of the land. Several farmers have fattened the last summer as many as 1500 hogs, and made most excellent pork. One and two hundred are considered an ordinary number. Hogs are usually killed at about 18 months old, and weigh from 200 to 300 lb. It may be asked if this rich soil will not soon be exhausted. Large fields have been cultivated for 16 years, and yielded 50 bushels per acre. There is, however, a gradual diminution of the quantity, and hereafter the farmers will be *willing to save manure, which is now thrown away. I was surprised to find hundreds of loads carted at an expense of* 12½ *to* 20 *cents, and thrown into the river to get it out of the way.*

The increase of the population, and the agricultural produce of the Western States, has been within these few years amazingly rapid. To judge of the situation and extent of these inland states, we here give an extract from the Report of the State of New York on the subject.

The western termination of the Erie canal looks out upon the Lake Erie, the more southerly and central of that great chain of navigable lakes which stretches far into the interior from our western boundary. Around these inland seas a cluster of five great states is rapidly rising. The territory which they comprise, and which is to become tributary to the canal, embraces that great area, extending from the lakes on the north to the Ohio on the south ; and from the western confines of this state to the upper Mississippi, containing 380,000 square miles. To measure its extent by well-known objects, it is fifteen times as large as that part of the state of New York west of the county of Oneida, nearly twice as large as the kingdom of France, *and about six times as extensive as the whole of England.* It contains 180,000,000 of acres of arable land, a large portion of which is of surprising fertility. . . . This group of inland states has two outlets for its trade to the ocean : one by the Mississippi to the Gulf of Mexico, the other through Lake Erie and the navigable communications of the state of New York to the Atlantic. Whether it be attributable to similarity of origin, or laws, or habits, or the ties of consanguinity, or superior salubrity of climate, their people evidently prefer the market in the Atlantic, and are making prodigious efforts to reach it. Three great canals, (one of them longer than the Erie canal,) embracing, in their aggregate length about one thousand miles, are to connect the Ohio with Lake Erie; while another deep and capacious channel, excavated for nearly 30 miles through solid rock, unites Lake Michigan with the navigable waters of the Illinois. In addition to these broad avenues of trade, they are constructing lines of railroads, not less than 1500 miles in extent, in order to reach with

more ease and speed the lakes through which they seek a conveyance to a seaboard. The circumstance, moreover, is particularly important, that the public works of each of these great communities are arranged on a harmonious plan, each having a main line supported and enriched by lateral and tributary branches—thereby bringing the industry of their whole people into prompt and profitable action; while the systems themselves are again united on a grander scale, in a series of systems comprising an aggregate length of more than 2500 miles, with Lake Erie as its common centre. Buffalo is the town situated at the termination of the navigation of the great lakes, and at the commencement of the Erie canal, leading to the Hudson, and thence to New York. Some idea may be formed of the commerce upon this line of route from the following facts:—There were received in 1835 in Buffalo, 86,233 bushels of flour, and 98,071 bushels of wheat, 14,579 bushels of corn, and 1,030,632 lb. of butter. In 1846, 1,324,529 barrels of flour, 4,744,184 bushels of wheat, 1,455,258 bushels of corn, and 12,692,071 lb. of butter. In 1836, the imports of the lakes were 2,324,248 dollars; exports, 14,137,026 dollars. In 1841, the imports were 33,483,441 dollars; exports, 32,432,581 dollars. In 1819, there was but one steamboat on the lakes; in 1845 there were upon the upper lakes 60 boats of 23,000 tons; some of them being of 1200 tons. The increase of shipping, both steam and sailing vessels, great as it is, does not keep pace with that of trade and population. In 1846, the tonnage was not sufficient to bring away the great storage of wheat of the Western States. It has been mentioned that the other outlet for the produce of the Western States is by the Mississippi to the Gulf of Mexico. Although not preferred by the majority of exporters, the increase of trade on this route has also been very great. In 1817 the steamboat navigation commenced. The whole tonnage, sailing boats, &c. was only 6,500 tons. In 1834, the steamboats had increased to 230, the tonnage being 39,000. In 1846, 750 steamboats were estimated to be running: tonnage 160,000; estimated cost, 12,000,000 dollars. Forty years before that date, a single large steamboat would have taken all the produce of the western rivers to New Orleans. In addition to these steamboats there are from 4000 to 5000 flat boats, which float down the river carrying produce to New Orleans.

The increase of the population of the States producing such an immense amount of agricultural produce, is also very striking. In 1800, the population of Ohio was 45,365; in 1846, 1,760,000. In 1810, the population of Michigan was 4,762; in 1846, 320,000. The population of Indiana in 1800 was 4,875; in 1846, 860,000. Illinois had in 1810 a population of 12,282; in 1846 it had increased to 722,000. Wisconsin, the most recently formed Western State, and to which emigrants are flowing in great numbers, had in 1840 a population of 30,945; in 1846 it had increased to 100,000. The mind can scarcely grasp the almost inconceivable amount of agricultural produce which the Western States will create fifty years hence, if the increase goes on in the same ratio as in bypast years; and when, in addition to the energy and perseverance which characterise the present, and which will in all likelihood do that of the future population, they will have at their command the resources of improved arrangements, and the advantages of scientific knowledge as applied to agricultural pursuits.

As to the routine of operations which have been gone through in commencing farming in America on what is called unimproved [illegible] uncleared land, we will now show.

Suppose a farmer has purchased 100 acres of land, he proceeds [illegible] the location in which it is situated, with his family in waggons, [illegible] provided with tents, &c., to house the family till the cabin or [illegible]ghouse is built.

In the centre of the farm profound stillness reigns. Surrounded [illegible] all sides by heavy trees, the farmer is at first sight apt to think [illegible]at [illegible] chances of success are small. Having hired the services [illegible] an [illegible]ced woodman, who will have a sturdy tree cut down [illegible] [illegible] [illegible]xperienced is looking where to begin the hewing [illegible] [illegible] [illegible]ting timber suitable for building,

Having fixed on a site near a spring for the house, the operation of building is begun. To build a log cabin is a very simple matter :—

Set posts in the ground (if yellow pine is selected it will last for many years) nine feet above the surface in the front, and seven in the rear. Stout poles or split logs, flattened at the ends, placed horizontally, and one upon the other, should be spiked or pinned to these posts all round—the upper ones in the front and rear laid on the top of the posts, in which a notch should be cut to receive them, taking care that they are sufficiently stout to bear the roof, which is to be formed of poles laid one end in the front and the other in the rear of the building. These poles should be covered with inverted sod, then earth, and sod again, surface uppermost. The openings between the side poles or logs must be filled up with clay, and a snug, weather-tight cabin is at once made. A comfortable floor may be made of lime and clay or marl, taking care to have the ground on which the building stands a little rising. A chimney may be constructed in the usual way—that is, with logs and clay; or, if a stove is used, which is better, the pipe may go through the roof, giving the part which is exposed to the weather a coat of tar and sand, both inside and out.

The next operation is cutting timber for fences. For this purpose oak-trees, that will split well, are selected, and cut into lengths of eleven feet. When sufficient space is cleared for cultivation, the logs are piled up in heaps, the limbs and brush on the top. These piles are set fire to in the spring, and the land ploughed. This, as may be supposed, is a matter of some difficulty, from the number of the stumps. Ploughs may be broken, and shins too, in this work. The smaller roots are grubbed out, and the larger ones divided : to stop vegetation, the outer bark should be taken off. Five or six acres may thus be prepared in the course of the winter by a man and boy. The first crop is Indian corn and potatoes: from forty to sixty bushels of corn per acre may be got. If the ground is in good order, the next crop may be wheat, the produce of which may be some fifteen or twenty bushels per acre. Care should be taken to leave sufficient woodland for fuel, and for a shelter for the cabin. A stock of provisions will have to be laid in for the first year, till the land becomes productive. The sum necessary to purchase stock and implements, for a farm of 50 acres, may be calculated at from 200 to 300 dollars—say, ploughs, 6 dollars; harrows, 5 dollars; waggon, 50 dollars; other small implements, 10 dollars; yoke of oxen, 70 dollars ; chains, 5 dollars ; two cows, 30 dollars ; twenty-five sheep, 37 dollars. The cost of erecting a log cabin in the State of New York, 16 by 30 feet, board roof, two floors, windows and doors, and stone chimney, is called 30 dollars. The reason of this amazing cheapness is, that little, or, in fact, no money is laid out in wages, the neighbours invariably lending their assistance. The settlers around are invited on a certain day, the timber is cut, and the teams they bring with them are used to haul the logs to the place where the house is to be built. The building is put up the same day, the logs hewn flat in the inside, the outside being left round—the chimney built up. All that the neighbours expect is their dinner, the settler finishing the remaining portion

of the work himself, purchasing the "lumber"—as the planks, &c., are called in America—the cost of which is shown, as above stated, to be some 30 dollars. B.

The History of Artificial Manures. From the German.—That agriculture is at present in a transition state must be evident to every one. Any attempt to introduce artificial manures a few years ago would have met the greatest ridicule; and yet now, in England, they see, without any surprise, manufactories for preparing them springing up in all the most important districts, and their sale announced in the various newspapers as systematically as anything else the farmer requires. There is no means for ascertaining the extent to which these preparations are used, but it is undoubtedly very great. The use of them is also extending to France, though not so general as in England; and it is with the hope of removing some of the prejudice with which artificial manures are yet regarded by our countrymen that we have undertaken this paper. To this end, nothing can be so effectual as an account of the principles upon which they are prepared, the crops to which they are most beneficially applied, and the benefits derived from their use.

Nature, with a due foresight of the difficulty of moving the agricultural mind, seems to have gradually paved the way for the adoption of artificial manures. Bones were the first which were introduced; and we were told by a Scotch farmer, that he remembers their first application to one of his father's fields—not as now, carefully ground to powder or crushed in a mill, but simply broken with hammers. He said that field had not yet forgotten the first dose. As, however, the price of bones is now much higher than it was thirty or forty years ago, such an extravagant use of them can no longer be tolerated. By means of proper machinery, bones are now broken into *inch bones*, *half-inch bones*, and *bone-dust.* The principal supply of bones for the English market is derived from Germany and South America, besides what is collected in the country; so that we are supplying these wonderful islanders not only with food, but also with the means of producing it for themselves. If the bones they so freely purchase be so valuable to them, they must be equally so to us. As bones are free from police or excise inspection when gathered in England for the use of agriculture, we are, of course, without any means of ascertaining the value of what is by this means procured; but as the duty of 1 per cent upon all bones imported produced £3000 about ten years ago, we can form some estimate of the extent to which they are purchased from foreign countries.* There can be

* [illegible] bones imported in 1848 were 32,582 tons; [illegible]

little doubt that their use is now much extended; and if we suppose that the home supply equals the foreign, we shall not greatly exaggerate if we estimate the annual value of bones used in agriculture at little short of 20,000,000 francs (£830,000.)

The first introduction of bones met with much ridicule, and their use has been almost forced upon farmers by the benefit they have seen their more enterprising neighbours derive from their application. We were told that those men who at first refused to use them have clung tenaciously to the use of bones, and resist even the conviction of their senses, as to the value of other artificial manures.

The value of bones having now been firmly established, the next step was the introduction of guano (or the dung of sea-birds) from various islands on the coasts of Africa and South America, within the tropics. This article had been in use in Peru from the time of the Incas, and the guano brought from that country still commands the highest price. The small quantity of rain that falls in Peru* (see Berghaus' *Physical Atlas*) insures the preservation of the soluble and most valuable portions of the guano through a long space of time. It is to our countryman Humboldt that the credit of introducing this substance first into Europe is due: the direct and indirect consequences of this will ultimately prove as important to mankind as the introduction of the potato or tobacco from the same hemisphere. In Germany, the value of this substance is well known, but the use of it has been hitherto too confined to make it an important article of commerce. It is used to a greater extent in France; but England, as in the use of bones, far exceeds all the rest of the world put together. The imports of guano into the latter country were—

In 1841,	1,800	tons.
„ 1842,	12,000	...
„ 1843,	4,000	...
„ 1844,	82,000	...
„ 1845,	219,000	...
„ 1846,	89,000	...
„ 1847,	82,000	...
„ 1848,	71,414	...
„ 1849,	82,817	...

The price paid by the farmers during this period has varied between £6 to £10 per ton; and these enormous quantities of guano, which have been required in addition to the bones imported, give us a more exalted opinion of the industry and intelligence of the English farmer than any panegyric could possibly convey.

It will be observed by the above table that the quantity of guano imported is becoming every year smaller, except the last. This is not in consequence of a growing doubt of its value, but

* See Johnston's *Physical Atlas*.—TRANSLATOR.

actually from the exhaustion of the supply. The Island of Ichaboe on the coast of Africa, from which many thousand tons were obtained, has been stripped down to the bare rock by the emissaries of the insatiable agriculturists, and once more abandoned to solitude. Considerable quantities are still brought from Patagonia; but, on account of the rain which there falls, the Patagonian guano is very poor in soluble matter, and is also relatively of less value than the Peruvian, on account of the much greater percentage of water which it contains. The islands in the South Sea, the well-known resorts of countless myriads of sea-birds, have also been carefully examined; but as might have been expected from the nature of the climate, the guano there discovered was worse than the Patagonian—in fact worthless. There seemed to be nothing for the farmer to look forward to but a gradual return to the use of bones; and if the whole of this enormous quantity of guano had really been necessary to maintain the fertility of the soil, now that the supply of that article was falling off, either an additional supply of bones must be necessary, or they must increase seriously in price, or the fertility of the land must be lessened by the use of a smaller quantity than formerly.

From this serious dilemma we are happily and completely rescued by a suggestion of another son of our Fatherland. To Humboldt we are indebted for guano, and to Liebig for the idea of dissolving bones in sulphuric acid.

In their natural state, bones are completely insoluble in water, and it is only by long decay, and the action of carbonic acid evolved in the soil, that they become available for vegetation. Under the old system it was therefore absolutely necessary to use these in large quantities, as, in consequence of the slow process to which they were exposed, much of the valuable portion of bones is altogether unavailable for the first crop. By dissolving them with sulphuric acid, what it requires weeks or months to effect in the soil is at once accomplished. About 30 to 40 per cent of the bones are at once rendered soluble, if the process be carefully performed. This, by rendering more of the bones available for the first crop, renders a smaller quantity necessary; and at one stroke, by causing the same quantity of bones to go further than before, relieves us from all fear that a short supply of bones, or the failure of the supply of the guano, would have any effect upon the cost of fertilisers, or the fertility of the soil.

This process of dissolving, or, as it should be more properly called, digesting bones with sulphuric acid, is yet received with distrust by many farmers. It is only by a more general diffusion of a knowledge of chemistry that the process will be thoroughly understood and appreciated. In the mean time, as in the case of ... the conviction ... the value of this new process is gra- ... spreading as ... impossible to resist the evidence arising

from the superior crops and reduced expense of those who have tried it.

As if in envy of the success of this hint from Liebig, several other processes have been recommended to effect the same change. Muriatic acid has been tried, but the muriate of lime produced by the action of this acid upon bones is not so useful to vegetation as the sulphate of lime, formed by the action of sulphuric acid. And another disadvantage consists in the difficulty of properly drying the mixture of muriate and bones, so as to fit it for application to the land, either by the hand or by means of different expensively-constructed drills, which are used by the English farmers for that purpose.

Some farmers prefer bones that have been previously boiled by the glue-maker, to bones in a natural state. The former are generally lower in price, but, if purchased soon after they have come from the glue-maker, they are so full of moisture that they are actually much dearer than other bones, notwithstanding an apparent trifling advantage in price. By boiling they are deprived of much of the azotised matter, or that portion of the bones which, when they are allowed to ferment, gives off a smell like guano. The loss of this portion of the bones is not a very serious matter, as very few crops are now grown without the use of a portion at least of farmyard manure along with the artificial manures. The farmyard manure, by supplying abundantly the same substances that have been removed by the glue-maker, renders them of less importance. Unless the farmer takes care to have the bones examined by a professional man, he runs some risk by purchasing the boiled bones. The value and importance of the other constituents of bones is, however, not so clearly understood as the phosphoric acid. The only difference between the action of inch, half-inch bones, and bone-dust, is that the latter are more speedy in their action than the half-inch, and the half-inch than the inch bones. For dissolving in sulphuric or muriatic acid, the bones need only be crushed under an edge-stone, a much more simple and cheaper process than the old one.

Besides dissolving in acid, some writers have recommended that the bones should be fermented with vegetable matter, as dry turf or ashes, or by heaping them up by themselves. In the latter case, if boiled bones have been used, little or no change will take place; and in the former, particularly with dry turf, a fermentation will go on; and carbonic acid being evolved, as in the soil, it will act upon the bones, and produce the same effect, though in a less degree, as either sulphuric acid or muriatic acid. The objection to this process is its slowness, and that it is nearly impossible to make it as thoroughly effectual as when done with sulphuric acid. This acid is sold in England at 1d per pound, and even lower; its price is not, therefore, there a difficulty. The proportion of bones

to acid should not be greater than three to one, to insure complete decomposition.

The next point after dissolving the bones in acid, is, how they can best be reduced to a proper form for application to the soil. When they are fermented, by being mixed with turf or ashes, no further attention is necessary; but in the pasty state in which sulphuric acid leaves them, it is quite impossible to apply them by either the hand or drill. To prepare them for this, some farmers mix the dissolved bones with coal or peat ashes, or even dry soil. To this there can be no objection, if the substance added contains no lime; because, should that be present in an uncombined state, the bones are at once restored to their original insoluble condition. Some manufacturers use gypsum for this purpose, and others chalk or quicklime—thus effectually restoring the prepared bones to precisely a similar condition as they were before the acid was applied, and making it a mixture of perfectly insoluble bones and gypsum, instead of containing from 30 to 40 per cent of soluble superphosphate of lime. This is the chief difficulty of the process, and, as it involves the value of the result, it should be managed with the greatest care. The alkalis, as soda and potash, dry up the mixture without any of these bad results, and leave the phosphoric acid in the best possible state for supplying the wants of vegetation. The chief objection to this is the additional cost, and until farmers have learnt that low price is in this case perfectly synonymous with an inferior article, we can hardly expect them to distinguish between an article costing £5, and another costing £8, especially if both bear the name of superphosphate of lime, by which these mixtures are now distinguished.

Notwithstanding this drawback, the use of the superphosphate is every year spreading and becoming more general, until it threatens to supplant the use of bones in their natural state altogether. It has had to overcome a keen opposition from ridicule and ignorance, but the previous steps which had been taken in the application of these artificial manures, in some degree prevents farmers from being surprised at almost anything being recommended as a manure. The objection to *try* these different substances, which had been much shaken by the results of bones, and still more by the evident value of guano, has been almost entirely removed by the success of these superphosphates. Farmers are now ready to use almost anything, and this has brought us to the point which we regard as most characteristic of the present day. The English farmer is now no longer satisfied with the results of his bone manure, nor even with the still more astonishing consequences following the application of guano; nor is he satisfied by being able to reduce the quantity of bones necessary to produce a crop by converting them into superphosphate. These gigantic strides do not satisfy him. The composition of guano, the most valuable

of all the artificial manures, becomes known by chemical analysis soon after it is discovered, and the question immediately arises—Can a mixture not be produced so as to answer the same purpose? Guano contains phosphoric acid, lime, ammonia, organic matter, &c. There can be no art in preparing a similar mixture.

Several receipts for effecting this were immediately offered by various eminent chemists, and at first with nearly uniform disappointment. Even Liebig himself, though perhaps his master mind was warped by the theories on vegetation which he had previously promulgated, has been unsuccessful in preparing a mixture of ingredients equal to guano in fertilising powers. We are not aware of the chemical composition of Liebig's manures, but it is some consolation to know that the first attempts of the English chemists were not one whit more successful.

These results were unfortunate, as they have undoubtedly checked the use of these artificial manures to some degree. As experience, however, has now taught the manufacturers of these imitations of guano the reasons of their failures, there is every year produced a more perfect article. And as men are now coming into the trade who have both character and capital to lose by failure, we must look for still further improvements, both from the result of the manures when applied to the crops, and from further discoveries in chemistry. In the latter direction, our German chemists are still unapproached.

But the climax to this singular progressive movement, unexampled in all the previous annals of agriculture, is the discovery of the coprolites, or *fossil dung*, in certain portions of the chalk series. Attention was first directed to the rocks containing these coprolites by some one observing, that a band of land across an estate always produced much more luxuriant crops than the adjoining land. Upon investigation this was found to contain some rather singular-looking nodules. These, when examined by competent chemists, were found to contain a much larger quantity of phosphoric acid than the best bones, and were pronounced by geologists to be the dung of those enormous lizards or crocodiles, which, countless ages ago, had roamed over the south-east portions of England.

If we have had occasion to express surprise that English farmers have greedily sought the dung of sea-birds, on the barren islands on the coast of Africa, and even from the inhospitable shores of Patagonia and Peru; if even the cattle on the prairies of South America cannot be allowed to die in peace, because their bones are needed; nay, if it be true that even the bones of the unfortunate beings who died at Waterloo have been employed to fertilise their fields—we need scarcely express surprise that the dung of these antediluvian monsters should also be turned to use by the English farmer. It is scarcely necessary to say, that the coprolites have

had little difficulty to overcome—they have at once made their way into the list of fertilisers. It has always been the wish of England to render herself independent of foreign supplies of grain; but the rapid increase of her population has hitherto prevented the accomplishment of this desire. Should these coprolites exist to any extent, if the English farmer be not rendered independent of a foreign supply of bones, he has at least another source of that phosphoric acid, which he has now thoroughly satisfied himself to be the most valuable portion of all manures.

The next point aimed at in the preparation of artificial manures, was a step beyond the mere imitation of guano, to which the first attempts were directed. Chemical analyses have clearly shown, that the ashes of cultivated plants consisted of a mixture of lime, potash, soda, sulphuric, muriatic and phosphoric acids, and several other substances. It was also observed that different plants contained these substances in very different proportions; but that analyses of the same plant, even by different chemists, showed such a similarity as to justify the conclusion that a certain mixture was characteristic of that plant. The conclusion immediately arrived at, from this stage of knowledge on the subject, was, that a mixture similar to the ashes of a plant had but to be prepared, and we would at once have the best possible manure for that plant.

No sooner was the suggestion given to the world than manures, not for general use like guano, or prepared bones, were at once offered to the farmer. One manufacturer actually went so far as to say, that the manure he offered was so carefully prepared, and so exactly suited to the plant which the farmer wished to grow, that the weeds, being of a different composition, would not be able to exist—thus manuring and clearing the land at one and the same time. Quackery and impudence could not go farther than this. More modest men contented themselves with offering manures for the straw of the cereals, for the grain, for turnips, for hay, for clover, for hops—in fact, a special manure for nearly every crop which the necessity or curiosity of the farmer might lead him to cultivate.

We have already said that the foundation of these manures was the analysis of the ashes of the plant to which they were supposed to be specially adapted.

The very most of these manures have been failures—some from ignorance, others from design, as not a few of them were manufactured for sale only. Others, again, failed because it seems to have been overlooked that the analysis of the ashes of a plant does not, in all cases, show the state of chemical combination in which these substances exist in the plant; and, secondly, if even it did show this exactly, still it by no means follows that the state in which the mineral ingredients are found in the plants is that in [illegible] ted for absorption into the plant itself.

Notwithstanding these partial failures, which have been the result of imperfect information, still the foundation is undoubtedly correct. If the land is to be maintained in fertility, we must certainly supply to it by means of manures, *all* the ingredients which are removed by the crops. The difficulty yet to be overcome is, the proper state of chemical combination in which these substances are to be combined in the manure, so as to produce the best possible result on the crops.

With regard to the phosphoric acid, there is now no doubt that bones or coprolites, digested with sulphuric acid, are the best source of this ingredient. As the English farmer derives a large quantity of bones from Germany and central Europe, our own agriculturists are surely in a better position than he is. In the price of sulphuric acid the English farmer has undoubtedly an advantage, but not so much so as seriously to counterbalance the greater cheapness of bones. With regard to lime, though there are other and less expensive methods of supplying any deficiency which may exist in the soil, it is also present to some extent in the bones.

It has already been remarked that potash and soda are the best substances which can be added to dry up the manure. They need not, of course, be chemically pure for this purpose.

Magnesia can be obtained from Epsom salts or magnesian limestone.

Chlorine or muriatic acid, though of less consequence than sulphuric or phosphoric acids, can easily be added by means of common salt.

With regard to ammonia, there is yet some difference of opinion; some chemists asserting that plants derive this substance from the air, and that it need not therefore be present in manure. It is, however, present in the best guano and in farmyard manure: we therefore think that those prepared manures will best maintain their character to which ammonia is added.

In fact, the best manures will be those which most closely imitate common farmyard manure.

Such, then, is a brief account of the steps by which English farmers have been led on, from the use of bones, to the establishment of extensive manufactories for preparing artificial manures. It is difficult to estimate the future effect of this great step in practical agriculture. That the continent of Europe is able to supply England with corn at a cheap rate, is because so much of our land is yet in a virgin state; and it is reflecting the highest credit on the English farmer, that he is able to maintain his land in a state of perpetual fertility. The extensive use of artificial, or chemically prepared, manure has greatly contributed to this result. To what degree of perfection English agriculture will ultimately arrive, it is impossible even to guess. The example is well worthy of imitation. The bones used by the English

farmer are purchased from us; and as the same strata which yielded the coprolites exists in Prussia and northern German doubt they will also be found there. In both these respec German agriculturist is upon equal or superior ground, h but the same industry and enterprise as the English farmer.

The turnip crop is that to which these manures have been extensively and most successfully applied. This root i foundation of English farming; and if even the artificial ma should ultimately prove of only partial benefit to the corn the consequences are not serious, as long as it can be gro abundance—the farmyard manure, which it supplies in abundance, insuring good following crops.

There have been numerous trials of these prepared ma upon corn crops; but hitherto with but partial success.

The clover plant seems to present a better chance; thoug these manures should be more useful to the clover than to th crop, it is difficult to assign an intelligible reason. It perhaps be advisable to say, that, up to this time, the experi have been more successful in the one case, and not to atten explain what is probably only caused by ignorance in the It is impossible to over-estimate the good resulting fro progressive improvement we have endeavoured to chronicle. with some hope of stirring up the emulation of the German fa that these pages are written,—and that, for the sake o Fatherland, they may emulate what has been therein desc is at once their duty and for their own advantage.

Notes on Wire-Fencing. By A. BINNING MUNRO, Esq. of A bowie, Stirlingshire.—It is now, I presume, quite understoo wire-fencing is the best and cheapest fencing that can be a in almost any circumstances; and it only remains to be sidered how the best wire-fence can be made at the cheapes I have lately served an apprenticeship in company with m excellent neighbouring smith, Mr James Sinclair, at Auchin (whose ploughs, I may remark in passing, cannot be excell making a firm "fur" on stiffish soil.) We have discovere there is no mystery in making wire-fences; and, moreover, t very best, with strong iron posts set into whinstone, can be at about the same cost as is usually paid for those with w posts. Mr Young seems to recommend wooden posts, and i be that the red-wood of old larch will last a good many year I saw lately a fence put up with posts of the best Memel fir, after standing less than five years, was a wreck; and I h show that strong iron posts do not, in fact, cost much mor the wooden ones. I have lately put up about 700 yards of with strong iron posts, in a very satisfactory manner; and t there is hardly any of it on a straight line, being at the side

approach, there is not one lateral stay in the whole fence. I think it will be useful to give an account of the fence, and an idea of the expense.

In the process of subsoiling land, I got a great many large land stones, of whinstone, granite, &c. Of these I put a very large one, say drawn with difficulty by four horses on a sledge, at each end, and at each side of gates or breaks in the fence. At each 90 yards I put a large stone, say a pair-horse sledge stone, for the other straining posts; and for the smaller posts, at intervals of 3 yards, or 2 yards where the radius of the circle was very small, I put a stone, three or at most four of which were a cartload. The large stones were put along, the smaller ones across, the line of the fence; and the longer in shape the stones are the better; and all the longest should be kept for the quickest turns, the posts being put in the end of the stones nearest the outside of the circle. In putting in stones having a flat and a round side, they should be bedded upon the flat side, and the hole bored on the apex of the round one, that there may be as little of the stone near the surface as possible, that the grass may not wither over it in dry weather. The straining-posts are round, and of 2½ inches diameter each, weighing 68 lb., and with stays in the common way. The smaller posts are of 1½ inches by ½ inch bar iron, cut at the proper length, with six holes for the wires, and weighing 10 lb. each. They are not squared at the end, to admit of their being put into a small hole, as is very commonly done, and which weakens the iron just where it should be the strongest; but the flat bar is kept entire, and the hole is made to fit it, instead of its being made to fit the hole; and thus the whole strength of the iron is preserved, of which the greater part is commonly wasted. The holes for the straining-posts are 6 inches deep, and for the smaller posts 4 inches. When the posts are put in the holes, the holes are to be filled with round gravel stones, and run in with melted sulphur, at 2d per lb., which is better than lead; for, in cooling, the lead contracts and leaves the post loose, which is not the case with the sulphur. After the posts are fastened in the stones, they are placed eyesweet and level by means of a tress and lever, with a strong iron or steel pin, which goes through the uppermost hole of the post. The first wire is then thread through, and the stones still farther adjusted, and the fence finished in the common way.

Land stones are generally to be had, greatly to the advantage of the cultivator who subsoils his land; and in the following estimate of expense, I shall not take the procuring of them into account at all. Good wire can be had at Stirling, and I presume in most market towns, for 8s. 6d. per bundle of 63 lb.

No.	4	gives	150	yards per bundle.
No.	6	gives	200	do.
No.	8	gives	300	do.

For 100 yards of fence it will require—

Of	No. 4,	4	thirds of a bundle.		
Of	No. 6,	3	do.	do.	
And of	No. 8,	2	do.	do.	
Or in whole,		9	thirds, or		
Three bundles, at 8s. 6d.	=	£1 5 6	for wire.		
33 posts, of 10 lb. each at 7s. 6d. per cwt.; say 3 cwt.,	=	1 2 6			

A journeyman blacksmith and two stout apprentices can bore and fit the posts for 100 yards easily in a day. With allowance for coals and wages, this will cost, say . . £0 10 0

And for $1\frac{1}{3}$ straining post for each 100 yards, bored and fitted, ... 0 6 6

Boring 33 holes with $1\frac{1}{2}$ inch jumpers, and 4 inches deep, the jumpers being provided by the proprietor, but maintained by the workman, at 2d each, . 0 5 6

Holes for straining-post, say, . . . 0 0 8

Or thus—

Wire, ...	£1 5 6
Iron for posts, ...	1 2 6
Boring and fitting posts, . . .	0 10 0
Straining-posts bored and fitted, . .	0 6 6
Holes in stones, ...	0 6 2
All other expenses should be nearly covered by	1 0 0
Total cost, per 100 yards, . .	£4 10 8
Or nearly 11d. per yard.	

It will surprise many that this, an unusually strong fence, can be put up so cheaply; but the following are the reasons:—

1st, The stones being very heavy and the posts very strong, and put into the stone without being weakened, no lateral stays are required even in a quick turn.

2d, The whole iron work is at the price of cost and work, and not at the fancy price of $2\frac{1}{4}$d. per lb., which would double the cost of the fence, or very nearly.

Our agricultural smiths are a hard-working, industrious class, and should [illegible] putting up all these fences, which, during [illegible] their employment is dull, would be [illegible] the proprietor it would be a [illegible]

[illegible] PETER MACKENZIE, West [illegible]ling.—From [illegible] observation, we have come [illegible] usion, that due respect [illegible] not paid to the old trees of [illegible]. If more attention were bestowed upon them, nobler [illegible] landscapes, -affording shade

and shelter, when required, in the various seasons of the year. An old writer on forest trees remarks, "that it is not to be passed by, that the very first law we find, which was ever promulgated, was concerning trees; and that laws themselves were first written upon them, or tables composed of them; and after their establishment in Paradise, the next we meet withal are as ancient as Moses—When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy the trees thereof by forcing an axe against them; for thou mayest eat of them; and thou shalt not cut them down (for the tree of the field is man's life) to employ them in the siege. Only the trees which thou knowest that they be not trees for meat thou shalt destroy and cut them down; and thou shalt build bulwarks against the city that maketh war with thee, until it be subdued. Which, though they chiefly tended to fruit trees, even in an enemy's country, yet you will find a case of necessity only alleged for the permission to destroy any other."

It has been well remarked, that, amid the infinite variety of natural productions adapted for the adornment of the earth, and supplying the wants of man, none awakens so powerfully our sympathy, or stirs our fancies with such lively interest, as those venerable sons of the forest which stand the living remembrancers of older times—the silent witnesses of the scenes that history treasures up of generations gone by—the sole memorials of many a stirring incident now fading in the dim shadows of tradition,

> Than a tree, a grander child earth bears not:
> What are the boasted palaces of man,
> Imperial city, or triumphal arch,
> To forests of immeasurable extent,
> Which time confirms, which centuries waste not?
> Oaks gather strength for ages; and when at last
> They wane, so beauteous in decrepitude,
> So grand in weakness, e'en in their decay
> So venerable,—'twere sacrilege to escape
> The consecrating touch of time!

The preservation of our ancient trees may be useful in many respects. To the antiquarian they will often point out the spots where the palace of the prince and the cottage of the peasant once stood, when little else remains of their past history. We are told that the venerable Hatfield oak still grows close by the site where formerly stood the Palace of Hatfield, a royal residence of Henry the Eighth, though now its sole remains are a dismantled ruin. The Windfield oak stands beside the grey old tower of Windfield Castle, where the unhappy princess, once Queen of France and Scotland, passed nine years of her sad captivity. Windfield Castle is long since a deserted ruin, the prison gate all broken down, and the matted clusters of the ivy gathering over its crumbling walls. The old oak which bears the name of the

castle stands directly in front of Queen Mary's Tower. It must have been in her day a noble tree, and still it stands in rugged strength, as if defying the storms of ages. Often have we thought, when wandering in the Torwood, where the famous oak of Wallace grew, that, if care had been bestowed upon it, it might have been existing yet, as a national monument, and a noble specimen of the vegetable race in a country like ours; for we are taught that the manner of growth in exogenous trees may be compared to a succession of hollow cylinders, increasing gradually in diameter, and sheathing one another. This being the case, and the last cylinder having its own independent vitality, it will be apparent that, under circumstances constantly favourable to growth, individuals of this kind may continue to exist for many ages; for there is no conceivable manner in which their death can be brought about in the absence of accidents—among which would of course be classed starvation, arising from the destruction of nutriment in the soil where they grow; and suffocation, caused by the obstruction of their respiration, whether by the absence of light or the exclusion of air.

In many parts of our country we meet with a solitary tree, commonly an ash—or, it may be, an elm, or a fine specimen of a Scotch fir—growing far apart from other trees; and we often wonder how they came there, or were allowed to remain. Sometimes there is a small clump of trees, some of them fine specimens of their kind, others in the last stage of existence, bearing the marks of the buffetings of many storms, and, it may be, a short allowance of provisions. Old age and poverty are ill to bear in the vegetable kingdom—even when they assail the monarchs of the woods—as well as in the animal; they make the strong bow before them. Neglect, and the destroying hands of admiring pilgrims, have wrought the destruction of many a noble plant; and nothing remains for the gratification of future generations but the spot on which they grew. If our trees could speak, many of them would cry out, "Gentle woodman, spare the tree." When inquiry is made respecting these old weather-beaten trees of a bygone age, we commonly learn, that once on a time a cot-house stood near by—or, it may be, an old farm-steading—and the trees grew near the garden, and the trees are all that remain to mark the spot where numbers of the human family were born, lived, and died: and, when looking on the old patriarchs of the vegetable family the mind goes back to a period, when

> [illegible] has watched
> The blossom [illegible] parent bough—time saw
> The acorn loosen from the spray—time passed,
> While, springing from its swaddling shell, yon oak,
> The cloud-crown'd monarch of our woods, by thorns
> Environ'd, escaped the raven's bill, the tooth
> [illegible] and [illegible] the schoolboy's knife, and sprang

A royal hero from his nurse's arms.
Time gave it seasons, and time gave it years;
Age bestowed, and centuries grudged not.
Time knew the sapling when gay summer's breath
Shook to the roots the infant oak, which after
Tempests moved not. Time hollowed in its trunk
A tomb for centuries, and buried there
The epochs of the rise and fall of states,
The fading generations of the world,
The memories of man.

Vhen we look upon the gigantic remains of trees that are ıd from time to time in our peat-mosses, and compare them h the living offspring of the present day, we are almost ready ome to the conclusion that we live in a degenerate age of the ld; for, with all our acquaintance with the science of arbori- ure, which depends on a knowledge of the nature of trees, of different agents in cultivation, and of the purposes to which s are applied in the arts—with all our knowledge, we seem come far short of producing anything like what has already n in the world before us. Such remains as we witness from e to time should stir us up to greater exertion to preserve the trees of our country, and study the best methods to encourage condition of our young woods and plantations. With great e the cultivator of exotic plants will strive to obtain specimen nts from various parts of the world, and look upon them with ght when they thrive under his fostering hand. Of many of se it may be said, that they are "born to bloom unseen, and ste their sweetness on the desert air;" for they are seen by , and their sweetness is confined to the narrow limits of a -house. Not so the hardy deciduous and evergreen trees that found in the orders *amentaceæ* and *coniferæ*. It has been ıarked of the former group, "Here is the order in which the timber trees of Europe, and most of those of all cold ntries, are stationed. Every genus consists of plants important the wants of man. The alder, the birch, the willow, the lar, the oak, the chestnut, the hornbean, and the plane, are collected in this place, to which they have been brought by the ıcidence of similar fructification, existing in all of them. This ilarity depends upon their producing flowers of one sex only, males of which are always arranged in catkins, of which the vers are destitute of calyx or corolla, in the place of which is duced a single scale. Their bark is furnished with an astringent ıciple, which has rendered them valuable either for staining ck, as in the alder and the oak-gall; or for tanning, as in the ; or as febrifuges, as the alder, the birch, the oak, and most of willows. The fruit of many *amentaceæ* contains a consider- e proportion of fæcula, which renders it fit for the food of man l other animals, as the acorns of the oak, the mast of the beech, nut of castanea and of corylus."

The order coniferæ is also of much importance in a country li ours, being arborescent and shrubby, and usually both resinous a evergreen. We are also informed that their real organisation w for a long period but little understood, until Brown discovered th the ovules of the entire order are naked. No other race of pla can be named of more importance to mankind than this: first, their resinous secretions, as turpentine, pitch, Canada balsam, & and, secondly, for their timber, which is used under the names fir, pine, deal, cedar, and many others. All the kinds of fir, ced juniper, pine, savin, cypress, and arbor-vitæ, are species of gen belonging to this order, which appears, from geological evidence, have existed in great abundance among the earliest vegetation t clothed the surface of our planet. In many respects our coun has much need of their clothing yet, to change its aspect a improve its climate; and to be more kind to those hardy trees t have been struggling for many years for an existence. If half care was bestowed upon our woods and plantations—and we m include our old memorial trees—that is freely given to objects far less importance, our country would be greatly benefited in physical condition; and, no doubt, other blessings would so follow.

In the article, "Age of Trees," in the *Penny Cyclopædia*, it stated "that everything connected with the growth of timber tre their duration, and the causes which conduce to their decay, b so directly upon points, not only of general interest, but of gr practical importance, that we have thought it advisable to dev an article to its separate consideration." In the same article so statements are made which we consider somewhat at variance w our experience and observation. It is stated, "In the course the inquiry into the method of computing the age of ancient tre a discovery has been made of some importance to timber growe inasmuch as it shows that those who plant for profit alone sho not allow their trees to grow beyond a certain number of yea varying according to the species; for it has been found that, so are exogenous trees from continuing always to increase in diame at the same rate, that every kind diminishes in its rate of grov after a certain age: the oak, for example, between its fortieth a its sixtieth year, the elm after its fiftieth, the spruce fir after fortieth, and the yew probably after its sixtieth. With referen to this subject, Professor De Candolle has constructed a table rate of growth, which we subjoin:—

Table of the Rate of Increase in Diameter of certain Exogenous Trees expressed in lines (twelfths of an inch.)

Years. to Years.	Quercus pedunculatus 130 years old.	Quercus sessiliflora 210 years old.	Quercus sessiliflora 333 years old.	Larch fir 255 years old.	Elm 335 years old.	Spruce fir 120 years old.	Yew 71 years old.
1 to 10	54	10	18	48	16	41	8
10 to 20	62	16	33	61	44	54	11½
20 to 30	54	22½	39½	58	58½	52	12
30 to 40	60	12	28	72	72	45	10½
40 to 50	48	13½	23	46	88	35½	7
50 to 60	44	14	12½	57	74	36	12½
60 to 70	56	10½	9	46	78½	18	8
70 to 80	44	11	9½	29	66	17	
80 to 90	32	9½	8½	30	59	13	
90 to 100	32	9½	8	24	45	13	
100 to 110	30	9½	7½	32	30	22	
110 to 120	36	9	8½	26	30	22	
120 to 130	30	9	8	20½	24		
130 to 140		9½	10	22	24		
140 to 150		10	8	23	18		
150 to 160		8½	8½	21	19		
160 to 170		9	9	20	17½		
170 to 180		10	8	19	23		
180 to 190		9	8	18	30		
190 to 200		9	7	21	34		
200 to 210		9	8	22	34		
210 to 220			7	22½	26		
220 to 230			6	21	36		
230 to 240			8	22	28		
240 to 250			8	20½	26		
250 to 260			7½		24		
260 to 270			8		17½		
270 to 280			8		26		
280 to 290			8½		28		
290 to 300			8½		29		
300 to 310			9		16		
310 to 320			8		16½		
320 to 330			8		21		

It is added, "It is very much to be wished that observations of this kind should be multiplied, as they would probably lead to some very important conclusions, and at all events would throw light upon a part of botany that is at present very obscure."

About twenty years ago, when some alterations were making at this place, three old ash-trees stood somewhat in the way, and as they appeared to be in an unhealthy state, with a great number of dead branches upon them, sentence of removal was nearly pronounced against them. However, they were allowed to remain, to make up the bank, where shrubs were to be planted. A considerable quantity of peat was used, and the roots of the ash-trees got a good covering of the peat put upon them. It was no wonder that the old trees made little progress the older they grew, for the food in the soil in which the roots were appeared to be nearly exhausted, and the trees were dying, branch by branch; and the rate at which they

were giving way would have soon made them all fit for firewood. But the peat, although a coarse kind of food, was quickly seized upon by the ash-roots, and to all appearance made as welcome as a supply of provisions to a starving garrison after a long siege, for the young fibres were found in clusters among the partially decayed matter that was within their reach. The trees soon assumed a different aspect, a more healthy appearance; they were, as it were, rescued from death of a lingering nature, and started afresh into life and vigour. Their foliage was of darker green, and remained longer on the trees; the shoots was stronger; and the layers of alburnum, or sap-wood, increased in thickness, although the ground above the roots of the ash-trees has been for many years covered with healthy evergreens. The ash-trees still continue to thrive, although the evergreens must deprive them of a considerable part of the food which they ought to have, and also of the sunlight, for the ground is double cropped—which is too often the case in different departments of cultivation, as well as in the growing of timber trees. Instances somewhat similar to the above occur frequently, and are brought forward by those who imagine that there is a probability of sensation in vegetables. Trees, and other vegetables, have the power of directing their roots for procuring nourishment. For instance, a tree growing near a ditch will be found to direct its roots straight downwards on the side next the ditch, until they reach the ground below it, when they will throw off fibres underneath, and ramify like the root on the other side of the tree. Some curious examples of this kind of instinct are related by Lord Kames, among which are the following:—"A quantity of fine compost for flowers happened to be laid at the foot of a full-grown elm-tree, where it lay neglected three or four years; when moved, in order to be carried off, a network of elm fibres spread through the whole heap, and no fibres had before appeared at the surface of the ground." His lordship also relates that, among the ruins of New Abbey in Galloway, there grew in his time, on the top of one of its walls, a plane-tree, upwards of twenty feet in height. Thus situated it became straitened for food and moisture, and therefore gradually directed its roots down the side of the wall till they reached the ground, at the distance of ten feet. When they had succeeded in this attempt, the upper roots no longer shot out fibres, but united in one; and shoots vigorously sprang up from the root which had succeeded in reaching the earth.

From the cases we have seen, from time to time of decaying forest trees becoming healthy when proper food was put within the reach of their roots, we would be inclined to think that the decrease of the diameter of the trunk, after a certain age, of certain species of trees, is the result of starvation in some shape or another; for, as one remarks, "a very large proportion of plants appear to be [illegible] indefinite period of existence, if it were not

for accidents and disease, independent of old age;" and there is much ground for believing that many accidents and diseases would be prevented if the natural wants of our forest trees were better understood—a knowledge of the food they required, of the benefit of sunlight, of the functions the leaves performed—in short, a knowledge of vegetable physiology, and of the agents required for successful culture.

It is well known that a considerable quantity of peaty soil is used for gardening purposes, and that many plants thrive well in it. It is no scarce commodity in this country, and we have recommended it frequently in this Journal for various purposes. We would again recommend it as a top-dressing for old trees that may be wished to be preserved for ornament or usefulness. It will require little preparation, and can be easily applied; and although it is well known that the extreme points of some roots of old trees extend a long way from the bottom of the trunk, yet many are near the surface and soon lay hold upon what is useful for them, and the mouths multiply with great rapidity, and the feeding process soon shows itself in the thriving state of the old plant. Those who have paid any attention at all to the state of a healthy tree, would observe that the foliage is more enlarged, and of a darker green, than those trees that are in a diseased or dying state. This circumstance should not be lost sight of by those who grow timber, either for profit or pleasure. The following lesson in vegetable physiology should not be forgotten by those who have charge of woods and plantations, and expect an extra increase of solid matter, called timber: "Nature, from the first moment that the rudiment of a leaf appears upon the growing point of a stem, occupies herself with the formation of woody matter, consisting of tough tubes of extreme fineness, which take their rise in the leaves, and which, thence passing downwards through the cellular tissue, are incorporated with the latter, to which they give the necessary degree of strength and flexibility. In trees and shrubs they combine intimately with each other, and so form what is properly called the wood and inner bark: in herbaceous and annual plants they constitute a lax fibrous matter. No woody matter appears till the first leaf, or the seed leaves, have begun to act; it always rises from their bases. It is abundant, or the contrary, in proportion to the strength, number, and development of the leaves; and in their absence is absent also." These remarks may be useful to those who grow wood in the temperate zone, for, as one remarks,—" In the temperate zone, those trees which change their foliage with the seasons, shedding their leaves as the winter comes on, and standing with bare branches through a succession of weeks, if hard and solid timber trees, are notoriously of slow growth, and require years in some cases to mature the texture of their fibres. This is the case with the oaks and elms. Where, however, vegetation is never checked by hyberna-

tion, as in most of the tropics, and in the evergreens of tem climates, woods may be of quick growth, and have a characters of durability, weight, and compactness."

In a country like ours, where the season of growth is of duration compared with other parts of the world, we should vour to make *wood* when the sun shines, and take every adv to promote a healthy vegetation.

We have seen many picture galleries in this country, the ex of fitting up and furnishing which incurred no small cost; migh not be living galleries of aged trees on every estate in this co which would be both useful and ornamental—or at least arbo of the indigenous trees of our native land? The expense wo trifling, compared to the beneficial results that would sprin of such a simple undertaking. It would be more satisfact look upon noble living specimens of timber trees abounding ever we travel, than be indebted to the page of the histori information, that there once existed noble forests of oak beech, and other hard timber; and, as one remarks, "to be discover the species of which these forests were composed, we have recourse to our peat bogs, and to the remnants of the a woods which still grace many parts of the country."

Professor Macgillivray, on the indigenous trees of North B enumerates about twenty species. Among these may be fou three kinds of wood into which trees are sometimes classi namely, resinous, hard-wooded, and soft-wooded.

This article would grow to an undue size, were we to dwel a little upon all our native trees. We will rather conclud the remarks of one who has paid particular attention to the tation of our native country: "The clearing of land for ag tural and particular purposes is rendered necessary by the pr of civilisation, which is fast extending her empire over the The great forests of all the barren districts have long ago va and have been partly replaced by trees imported from the nents of Europe and America. Even many of the Highland have been filled with those trees; and the few patches of n wood left in the Lowlands have been so intermixed with p trees that one cannot separate the natural from the artifi them. The time is, perhaps, not far distant when the remo tricts will cease to produce an unmixed vegetation, and whe botanist wandering among their deep glens, and by their se lakes, will see on the craggy cliffs the native products of th mingled with those of distant lands. But surely no trees c better adapted to the climate of Scotland than our own trees; and it remains to be proved that the oak, the ash, th the pine, the birch, and the mountain ash, are not as valuable ornamental, as many other trees which are made to supplant t

Since writing the above, we have met with an article o

renovation of decayed trees by the late Sir Henry Steuart, communicated in a letter to Admiral Sir T. Livingstone, Bart., which ought to be in the hands of all who have trees in their possession: a few extracts from it may be useful to many.

Agreeably to my promise, I shall now give you an idea of my method of reviving or resuscitating old trees, which has often succeeded with myself, and which I here recommend to others; but there is no account given of it in the notes on my treatise on the application of the science of physiology to practical tree-culture, and particularly in removing large trees for ornament.

The decay of old trees, both in England and Scotland, has been a subject of general complaint, during at least a century; and it is observed with regret that their place does not promise to be very speedily supplied by existing woods and plantations. The general causes of the decay of trees are twofold—the first proceeds from diseases to which all woody plants are subject; the second from extreme old age, but more frequently from their having exhausted the pabulum within their reach. The pathology of the vegetable tribe in this respect differs materially from that of the human species. Among the sons of the forest there are no vicious efforts made by individuals, as among us, by means of disease to shorten life; there are no gourmands nor sensualists, by fatal indulgence and artificial luxuries to bring on a premature old age. The laws of nature in trees are allowed freely to operate; and their existence, therefore, may be reckoned on, and even prolonged by art, to an indefinite period. It has been said that the roots of trees in a favourable soil will go abroad, in search of their food, to a distance from the stem equal to the entire height of the tree taken from the ground; and wherever this is found to hold good, trees will live to a very great age, especially in a deep and calcareous soil.

Of your two fine old trees at West Quarter in Stirlingshire, which I lately examined—a holly and a double-flowering thorn—I must say that they appear to me to have declined chiefly from the *latter* of the two causes above mentioned—namely, their having exhausted the food or pabulum in their immediate neighbourhood; and, in the case of the thorn, in some measure from the ground being overstocked with other plants, that greatly crowd upon it, even to the exclusion of light and air, without which no plant can flourish. As to the holly, it seems stunted and hide-bound, and sends out no free shoots at top such as a tree in health, in so fine a soil and climate, ought to do. The terminal growths of the thorn also have begun to decay; and if some salutary remedy be not speedily adopted to *excite the roots to fresh action*, it is plain that the evil will ere long extend to the greater branches, and, as a necessary consequence, to the trunk itself.

He then recommends—

The clearing away of the ivy from the stem of the thorn, and to clear the ground, for a considerable space, of overshading shrubs and bushes: secondly, to dig a trench round the tree, not exceeding three and a half or four feet out from the stem—the trench to be five feet broad, and deep enough to penetrate the soil and subsoil. In doing this, the workmen may fearlessly cut through all the roots they meet with, leaving only three or four great ones, on the south and south-west sides, to act as *cables* in resisting the severe winds that usually blow from those quarters in every part of the island. The good earth from the trench is to be saved, and the bad wheeled away; the trench is to be filled with well-prepared earth and dung, so as that a proper chemical action may be excited throughout the mass, and the whole rendered fit for the food of plants; all dead wood is to be removed carefully with a saw; all moss in the spring is to be taken from the bark, and the stem well washed two or three times during the summer season, with soap and water and a soft brush.

By following the above method—which, however elaborate it may appear in the description, will be very easily reduced to practice—I feel confident that many fine old trees in gentlemen's parks, that are now allowed to decay, might have *another century* added to their existence—

Because the extension of fresh pabulum at pleasure to greater limits would be a

labour well repaid, and attended with little expense, and as little difficulty. There are few persons who would not bestow more labour than this on a favourite tree, and there are perhaps fewer who will not admit that it might easily be applied to purposes of general utility, as well as local ornament. The principles on which this process has been instituted are in accordance with the laws of animal as well as vegetable physiology, and will be confirmed by practice, if they be allowed to govern the process. I have uniformly found that the roots, where cut through in the opening of the trench, will send forth an immense body of vigorous ramifications, of from a foot to fifteen inches in length, during the first and second months after the operation, with thousands of capillary rootlets emanating from them, all which will go abroad in search of sap for renovating the vigour of the tree. In a tree of considerable age —such as the tree above alluded to, at your beautiful place—it is to be observed that much figure cannot be expected to be made the first year in the elongation of its terminal shoot; and for this plain reason, that effects must necessarily be preceded by their causes, whether they lie on the surface or otherwise; but the leaves will speedily become larger, and of a deeper green colour than for some years past, and by the autumn of the second year it will be admitted that the tree is in some sort about *to renew its youth.*

In conclusion he adds,—

The month of February or beginning of March, according to the season, before the ascending sap begins to stir, would of course be the best time to carry into effect the methods of resuscitation above detailed.

Fiars of Kincardineshire from 1691 *to* 1697.—The following is a return of the Fiars Prices of corn and meal, for the county of Kincardine, for the years 1691 to 1697 inclusive. The document is a very curious one, and was found by Mr Ogilvy of Ineshewan amongst old papers in the archives of the family. We give it *verbatim et literatim*, only with the addition of a column containing a conversion of the Scots into sterling monies. It is also proper to mention that the boll, according to the old Kincardineshire measure, was as follows:—

	Bush.	Peck.	Gall.	
Barley, Oats, &c.,	6	1	1.544	Imp. measure.
Wheat, . .	4	0	1.072	,, ,,

In round numbers, 2 bolls of barley, &c., were equal to 1½ quarter Imperial measure; and two bolls of wheat (the measure of the bolls being nearly the same) were equal to one quarter Imperial measure.

Fiers the Victual underwritten cropes of God fey vy &c., ninty one, ninty two, ninty three, ninty four, ninty five, ninty six, and ninty seven years, as the [illegible] appretiate and got down in the Shirref Court books of Kincardin

[illegible] LAMBASS FIERS 1691.

	Conversion into Sterling.			
	£	s.	d.	
[illegible] . .	0	6	8	
[illegible] the boll [illegible] . .	0	5	6	8-12ths
[illegible] shilings eight [illegible] . .	0	7	2	8-12ths
[illegible] of th[illegible] six shilings eight penie[illegible] . .	0	6	1	4-12ths
[illegible] of the [illegible] merks .	0	4	5	4-12ths
[illegible] merks [illegible] shilings eight [illegible]	0	9	5	4-12ths

Candlemass and Lambass Fiers 1692.

Price of the boll ferm meal, three pounds thirteen sg. 4d.	0	6	1	4-12ths
Price of the boll bear, four pounds thirteen sg. four penies, ...	0	7	9	4-12ths
Price of the boll white oats, three pounds thirteen sg. 4d.	0	6	1	4-12ths
Price of the boll pease, four pounds thirteen sg. four penies, ...	0	7	9	4-12ths
Price of the boll broked oats, two pounds thirteen sg. 4d.	0	4	5	4-12ths
Price of the boll wheat, seven pounds, . . .	0	11	8	

Candlemass and Lambass 1693.

Price of the boll ferm meal, four pounds, . .	0	6	8	
Price of the boll bear, seven merks, . . .	0	7	9	4-12ths
Price of the boll white oats, four pounds, . .	0	6	8	
Price of the boll pease, seven merks, . . .	0	7	9	4-12ths
Price of the boll broked oats, three pounds, . .	0	5	0	
Price of the boll wheat, ten merks, . . .	0	11	1	4-12ths

Candlemass and Lambass 1694.

	£	s.	d.	
Price of the boll bear four pounds six sg. 8d., . .	0	7	2	8-12ths
Price of the boll white oats, four pounds six shillings eight-penies, ...	0	7	2	8-12ths
Price of the boll pease, four pounds six shillings eightpenies,	0	7	2	8-12ths
Price of the boll ferm meal, four pounds, . .	0	6	8	
Price of the boll broked oats, three pounds six shillings eightpenies, ...	0	5	6	8-12ths
Price of the boll wheat, six pounds five shillings, .	0	10	5	

Candlemass Fiers 1695.

Price of the boll ferm meal, ten merks, . . .	0	11	1	4-12ths
Price of the boll bear, ten merks, . . .	0	11	1	4-12ths
Price of the boll white oats, ten merks, . . .	0	11	1	4-12ths
Price of the boll broked oats, seven merks, . .	0	7	9	4-12ths
Price of the boll pease, eight pounds, . . .	0	13	4	
Price of the boll wheat, eleven pounds, . . .	0	18	4	

Lambass Fiers 1695.

Price of the boll bear, ten pounds, . . .	0	16	8	
Price of the boll white oats, ten pounds, . . .	0	16	8	
Price of the boll pease, ten pounds, . . .	0	16	8	
Price of the boll ferm meal, ten pounds, . . .	0	16	8	
Price of the boll broked oats, ten merks, . . .	0	11	1	4-12ths
Price of the white, twelve pounds, ...	1	0	0	

Candlemass Fiers 1696.

Price of the boll bear, eight pounds, . . .	0	13	4	
Price of the boll ferm meal, ten merks, . . .	0	11	1	4-12ths
Price of the boll white oats, ten merks, . . .	0	11	1	4-12ths
Price of the boll broked oats, eight merks, . .	0	8	10	8-12ths
Price of the boll pease, eight pounds, . . .	0	13	4	
Price of the boll wheat, twelve pounds, . . .	1	0	0	

Lambass Fiers 1696.

Price of the boll bear, thirteen merks, . . .	0	14	5	4-12ths
Price of the boll ferm meal, eight pounds, . .	0	13	4	
Price of the boll white oats, eight pounds, . .	0	13	4	
Price of the boll pease, thirteen merks, . . .	0	14	5	4-12ths
Price of the boll wheat, twelve pounds, . . .	1	0	0	
Price of the boll broked oats, six pounds, . .	0	10	0	

CANDLEMASS FIERS FOR THE YEAR 1697.

	£	s.	d
Price of the boll ferm meal, six pounds, . . .	0	10	0
Price of the boll bear, eight pounds, . . .	0	13	4
Price of the boll pease, nine pounds, . . .	0	15	0
Price of the boll wheat, ten pound thirteen sg. fourpenies,	0	17	9
Price of the boll broked oats, four pound thirteen sg. fourpenies, ...	0	7	9
Price of the boll white oats, six pounds, . . .	0	10	0

Extracted forth of the court books of the Shirrefdome of K
be me Shirref Clark under subscribeing—

JA. IRVIN

Stonhavine, the 7 day of July 169

Receaved then by order from Mr James Irvine, Shirreff Clerk cardine my Master from Robert Keith in Read Cloack seven fourt ling peaces for the extract of the fiers of the years within writen presents writen and subscrybed with my hand day and place foresaid

JOHN BREME

OUR AGRICULTURAL LABOURERS—ENGLISH, IRISH, AND S

By Mr W. BURNESS, London.

NATIONS may talk of the greatness of their manufactu the success of their commercial enterprise; but boasting c things, in these times, is no evidence of realities. The hi the world in all ages pronounces but one undeviating de the subject—that the prosperity of every nation is proport the industry of its agricultural labourers; hence the marke tion which the greatest of statesmen have bestowed upon the is true, that manufactures and commerce have given rise discussion in the senate—so does the sickly child and the p in the parlour; but, doubtless, if the latter cannot be adva favour of the one, neither can the former in favour of the o

No nation, perhaps, has more right to boast of its manufa and commercial industry, generally speaking, than Britai nowhere do we find such striking anomalies as among her a tural labourers! Science, certainly, has been more succe reducing the labours of the former to something like e than those of the latter. The simple craft of more simpl has fled before the mechanical ingenuity of Glasgow, Man and Birmingham. But in agriculture, the ingenuity of th bandman has not yet succeeded in banishing such implem the caschrom, &c.

Britain, however, exhibits more interesting anomalies amo agricultural labourers than those just referred to, relative implements. A compound of various tribes, the sworn e of each other, it is not to be wondered at that nationalit most diversified should at one period have existed, connect the management and domestic economy of this class of the

tants of the British isles. But how these have been transmitted to posterity so complete and unchanged in character, and how Englishmen, Scotchmen, and Irishmen pertinaciously cling to them, in many instances with a warmth of zeal more like religious fanaticism than the spirit of intelligent workmen, is a question not so easily reconciled with the progress of science and the march of modern improvement, already referred to, in the other branches of industry. In every art, it is but natural to look for something like uniformity in the qualifications and circumstances of its artisans. However diversified their talents may be when individually examined, yet, collectively, a common level characterises the whole; and in every case, generally speaking, there is no better index to the perfection which any art has attained than this very level itself. But when we examine the qualifications and circumstances of the agricultural labourers of England, Scotland, and Ireland, we are driven to the conclusion that as yet a common level has not been attained, or approximated to. A cursory review of their numbers, employments, incomes, amount of labour performed, and the produce of their labours, brings before us results the most conflicting imaginable—results which call loudly for progress.

1°. *Number of Labourers.*—In England, according to the census of 1841, there were, above the age of twenty, 724,625 men—Wales, 47,477: total, 772,102 of this age. Under this age in the former, 139,661—in the latter, 17,155: total young men and boys, 156,816. Of females engaged in agriculture above the age of twenty, 26,888 in England, and 1,300 in Wales: total, 28,188. Under this age, 8,460 in the former, and 735 in the latter: total, 9,195:—grand total, 37,383. Of agricultural labourers, male and female, according to this account, we would have for England, 899,634, and Wales, 66,637: total, 966,271. If we add to this sum the number of small farmers who cultivate their own farms, and also take into account the assistance received from Ireland and the manufacturing classes during harvest, both of which is necessary in any comparative view, we cannot estimate the total number of labourers employed annually in English agriculture at less than 1,000,000 effective hands.

In Scotland, there were estimated to be at the same period 109,550 men, and 39,854 young men and boys: total males, 149,404. Of females, there were above the age of twenty, 13,528, and under that age 5,114: total, 18,642:—grand total, men and women, 168,046; and giving credit for assistance, as in the case of England, the number of effective hands annually engaged in Scottish agriculture may be set down at 170,000.

In Ireland, we shall have more difficulty in coming to satisfactory conclusions. "It is estimated, that about 5,358,000 persons are directly dependant upon the cultivation of the soil." If we take five as the number of members in each family, it will give us

1,070,000 heads of families. Of this number, 300,000 occupy under five acres of land each — 250,000 under fifteen acres, and 70,000 thirty acres and upwards; so that we may set down the number of farmers who only rank as labourers at 600,000; and householders, or heads of families, only 400,000: total labourers whom we may consider above the age of twenty, 1,000,000. This number, being heads of families, would embrace a population of 5,000,000, equally divided, or nearly so, as to sex. If we estimate the number of boys and girls under the age supposed fit for labour at 2,000,000, it will leave us a remainder of 1,000,000 more labourers, 500,000 young men and boys, and an equal number of young women and girls; so that Irish agricultural labourers stand thus: — Indoors, 1,000,000 mothers and 2,000,000 children; outdoors, 1,000,000 fathers and 1,000,000 sons and daughters: total, 2,000,000 engaged in agriculture.

Such being the number of labourers in each of the three kingdoms, exclusive of 4,246 for the isles of the British seas, and 45,727 gardeners for England, 1,218 for Wales, 6,418 for Scotland, and 287 for the isles, the following will present a tabular view of the whole—

England and Wales,	1,000,000
Scotland,	170,000
Ireland,	2,000,000
Isles of the British seas,	4,246
Total agricultural labourers,	3,174,246
Gardeners,	53,650
	3,227,896 *

2°. *Employments.*—If we take one ploughman for every fifty acres, which is about the rate calculated in Huntingdonshire with one plough, and assume the rest of the labourers for all England to stand in the same ratio to ploughmen as the labourers did to the ploughmen with which we stood connected in the same county, then we may deduce the following analyses—

Ploughmen in regular employment,	263,000	
Cattlemen and shepherds, exclusive of boys,	87,666	
Total generally employed on day's wages,		350,666

* The above is principally quoted from M'Culloch's *British Empire*; and, in this [illegible] may append th[illegible] of farmers and graziers—

England [illegible]	258,232
Scotland	54,866
[illegible]	685,309
[illegible] British seas	3,960
[illegible]	1,002,367

[illegible] appears to be in England four [illegible] for every farmer; in Scotland about three and a half; and in Ireland the [illegible] farmers exceeds [illegible] labourers, not reckoning their own families [illegible]

Taskmen regularly employed,	131,500	
Young men and boys under 20 years of age,	100,000	
Total of this class,		231,500
Taskmen not regularly employed,	289,906	
Young men and boys,	56,816	
Total of this class,		346,722
Females,		37,383
Small farmers and reapers in harvest,		33,729
Grand total as before,		1,000,000

We may take the same ratio for Scotland as we have done above for England as to ploughmen, thus—

Ploughmen,	67,800
Cattlemen and shepherds,	20,000
Common labourers,	21,750
Young men and boys,	39,854
Females,	18,642
Small farmers and reapers,	1,954
Total as before,	170,000

In Ireland, where system and order form the exception, the subdivision of labour into employments is not to be looked for. He who carts out the manure must also spread it, and afterwards plough it into the soil; and he who sows the seed must also harrow in the same, let consequences follow as they may. The grand problem, in the sister country, is to get the 2,000,000 hands started upon the field. Her arable acres are generally cultivated either with the plough, spade, or loy, generally seeded, and her crops are invariably harvested. Her cattle are also cared for. All this is done by her own 2,000,000 labourers, without any assistance from England, and the following may convey some notion how it is accomplished.

Two small farmers, for instance, each holding some ten acres, will each keep a horse. These join and form a plough, which is sometimes the property of one, but as often the joint property of both, although one generally pretends to own it. In a few cases, one of the two may manage the team when in yoke; but, in the generality of cases, both are required—the one to hold the plough, and the other to drive the horses. If they are active, as Irishmen count activity, they may cultivate some thirty to thirty-five acres. There are perhaps 80,000 small farmers, who have a horse each, and join in this manner, making 40,000 ploughs. If we say 35 acres to one plough, then these will cultivate 1,400,000 acres. There are, again, perhaps 20,000 farmers, holding from 15 to 20 acres each, who keep a pair of horses and plough. Many of this class are above the rank of jobbing farmers, and only assist their own relatives. We cannot, therefore, in this case, set down more than 25 acres to each ploughman; so that the whole would only

cultivate 500,000 acres. A holding of from 25 to 30 acres is considered a "*brave farm*;" and, with few exceptions, gives full employment to a ploughman and pair of horses. Of this size there may probably be 40,000 farmers, each having a hired ploughman, ploughing on an average 30 acres—total, for this class, 1,200,000. There may probably be cultivated, with the spade and loy, 500,000 acres more, leaving a remainder of 2,150,000 acres to be cultivated by landlords and gentlemen farmers, at the rate of 40 acres to a plough. We know of many of this class, who equal this country, and plough 50 acres with each team; but a great many, who only farm from 40 to 80 acres, keep two ploughmen—a circumstance which will bring down the average to what we have stated, making the total number of ploughmen, in the employment of this class, 53,750. The number of ploughmen and ploughs employed in the cultivation of Ireland, may be thus tabularly stated:—

		Ploughs.	Acres.
80,000	small farmers conjunctly, . .	40,000 at 35 acres,	1,400,000
20,000	... singly, . .	20,000 at 25 ...	500,000
40,000	hired ploughmen, . . .	40,000 at 30 ...	1,200,000
53,750	... . . .	53,750 at 40 ...	2,150,000
250,000	labourers with the spade and loy,		500,000
443,750		153,750	5,750,000

We have thus succeeded in starting nearly a fourth part of the Irish labourers on the field, but the most difficult part of the problem remains to be solved—the getting of a job for the remaining million and a half. The management of live stock upon small farms is always an expensive concern, and the number of small holdings in the sister country consequently increases the number of persons engaged in this employment. The amount of labour expended in this department, including the dairy and the management of pigs and poultry, as well as oxen and sheep, probably comprehends the labours of the one-fourth of the labourers engaged in Irish agriculture; so that we may appropriate 500,000 of them to this job, the one half of whom will be women. This would still leave a balance of 900,000, besides the 250,000 engaged probably one-half of the season upon their own holdings with the spade and loy. Probably 150,000 of these again may be for the most employed at the species of jobs falling to the lot of the common labourer by landlords and gentlemen farmers; but regular employment for any of this class, generally speaking, where so many are idle, forms the exception. "Fair play," the continual, or we may say the national watchword, in the sister country demands a share for each, and this is generally given if possible. Hence the intermittent character of the operations of the field which so continuously present themselves to a stranger, but which are unobserved by [illegible] parties either master or servant. Twenty labourers

may be seen collected into a field to perform a job which one Scotchman or Englishman would have to do in a week. If they finish it the master is content: fewer hands would not have done so, and hence would have encroached upon to-morrow; and with this opinion the labourers are fully satisfied. "The job was never done so well in one day with a less number. It is not fewer hands which Ireland wants, but an additional job, at present unhappily 'lost for the want of seeking,' to fill up the odd days of the calendar!"

From these approximations, the agricultural labourers of Ireland may be thus stated in round numbers:—

Ploughmen, or those generally engaged at horse work,	450,000
Attending live stock and the dairy, . . .	500,000
Employed for the most part on their own holdings, .	250,000
Do. ,, by landlords, &c., .	150,000
Occasionally, ...	600,000
Harvest work in the United Kingdom, equal to .	50,000
	2,000,000

3°. *Incomes.*—In England the wages of the labourer are generally paid in cash, with the exception of an allowance of beer or cider during hay or corn harvest. The amount is very various, the rate in some counties being nearly double that in others. In Huntingdonshire, which may be taken as an average, first and second rate servants may have, the former 12s. per week, and the latter 10s.; inferior hands from 8s. to 10s.

As the price of wheat rises above the ordinary level, the wages of the labourer are increased. This equitable rule is somewhat different in form in different districts, but the same in principle throughout. In some districts, instead of giving an advance in money, wheat is allowed at a fixed price, while in other districts wages are regulated by the price of bread. If the half-peck loaf, for instance, is sold at 1s. 8d., the wages of the labourer may be 1s. 10d.; and if at 2s., then 2s. 4d. per day, or 14s. weekly, the sum which we paid in 1847 to common labourers—being an increase over that of 1845 of eightpence per day, 4s. weekly, or £10, 8s. per annum. Some landlords and farmers, we believe, paid a higher advance, while others paid a less, so that this may be regarded as an average. The following accounts will exhibit the whole of a labourer's receipts, under ordinary and high-priced years:—

First-rate Ploughmen, Cattle Men, and Shepherds, under ordinary years.

48 weeks at 12s. per week, . . .	£28	16	0
4 ,, harvest at 22s. do., . . .	4	8	0
Ale, and other allowances, . . .	2	0	0
Yearly income of principal servants, . .	£35	4	0
Advance under high prices, . . .	10	8	0
Yearly income under high prices, . . .	£45	12	0

Second rate Ploughmen, and Common Labourers.

48 weeks at 10s. per week, . . .	£24	0	0
4 ,, harvest at 20s. do., . . .	4	0	0
Ale, and other allowances, . . .	2	0	0
Yearly income of this class with average prices,	£30	0	0
Advance under high prices, . . .	10	8	0
Yearly income under high prices, . .	£40	8	0

The yearly income of a taskman may be thus stated, supposing that a loss of one week is sustained from bad weather during the whole period.

3 weeks at day work, during the year, at 10s. per week,	£1	10	0
41 ,, making on an average 12s. 6d. at task, .	25	12	6
3 ,, hay and pea harvest making 15s., . .	2	5	0
4 ,, at corn, ,, ,, 25s., . .	5	0	0
Beer, and other allowances, ...	£2	10	0
Yearly income in this case, ...	£36	17	6
Advance under high prices, ...	10	8	0
Yearly income under high prices, . . .	£47	5	6

The wages of boys regularly employed may be given, as in the following account, which will also exhibit the net income of an industrious labouring man and his family. The prices are about an average of the real prices which we paid them in 1847, as taken from our private cash-book, so that the difference between the two is immaterial.

Income of the father as formerly stated, ...				£47	5	6
Eldest boy, 48 weeks at 7s. 6d., .	£18	0	0			
,, 4 ,, harvest at 15s., .	3	0	0			
Beer, &c., ...	1	0	0			
				22	0	0
Second boy, 48 weeks at 5s., . .	£12	0	0			
,, 4 ,, harvest at 10s., .	2	0	0			
Beer, ...	0	10	0	14	10	0
Besides the above two boys, we had occasionally a third, two sisters and the mother, the joint weekly earnings of whom were 11s. and during harvest the latter was worth to her husband 12s. per week. If we say from this source only				6	4	6
Then the yearly income of the family will be . .				£90	0	0

The incomes of labourers irregularly employed we cannot approximate with the same degree of accuracy. Their work is generally performed by the task—a system, although it has got many advantages to recommend it to both parties, yet, with a dense population, it is liable to be abused. Generally, a few choice hands, besides horsemen, cattlemen, and shepherds, are regularly employed during the whole year, while the majority are only called in during hoeing and harvest time. As soon as their services can be dispensed with they are dismissed, and the greater their numbers are in any district, the shorter will be the period of their employment. They are not only dismissed when the jobs they have undertaken

are finished, but, in the event of unfavourable weather intervening during the execution of these, so as to stop the process of hoeing or reaping, &c., the regularly employed taskmen have other jobs to go to of a different kind, while they have to lounge about the village idle, in dubious uncertainty, for several days together, until a change of weather takes place. It not unfrequently occurs that a whole week transpires without a single day's employment, or wages coming in. At any time, a job on this farm, and another on that—a week here, and a week there—is the manner in which this portion of our rural population is employed. The result as to yearly income is obvious; for, what from the loss of time by bad weather, and between jobs, a general loss is sustained, amounting to a serious deduction—probably not less than from *one-third* to one-fourth of the wages of the other section of this class of labourers regularly employed. Such being the case, their yearly incomes may be stated at £25 on an average, and £35 under high prices, as in 1847, for crop 1846.

Women have from sixpence to tenpence per day. But, as out-door labourers, they have a great many "broken days" from bad weather; so that the yearly income of the 37,383 cannot be estimated at more on an average for each than £10.

If we now suppose the average incomes of labourers regularly employed, including horsemen, cattlemen, shepherds, and taskmen, to be £35 per annum; the balance to men not regularly employed, £25; boys regularly employed, £16; irregularly, £10; and women, £10; then the following account may be taken as an approximation to the cost of manual labour applied to the English soil annually:—

Ploughmen, &c., regularly employed,	482,166, at	£35,	£16,875,810
Taskmen, &c., irregularly,	323,635, ,,	25,	8,090,875
Boys regularly employed,	100,000, ,,	16,	1,600,000
,, irregularly ,,	56,816, ,,	10,	568,160
Women,	37,383, ,,	10,	373,830
Total,	1,000,000,		£27,508,675

In Scotland, labourers are partly paid their wages in money, and partly in kind. There are very few exceptions from this plan in any of the counties. An unmarried man may have from £10 to £18 per annum, with bed and board; the difference in the wages of good and bad servants being always computed in cash. Instead of their victuals in the farm kitchen, they frequently receive an allowance of oatmeal, milk, and firing, with a "bothy" in which to cook for themselves. Taking the average at £14, the boll of oatmeal (140 lb.) at 20s., then his income may be stated thus:—

Cash,	£14	0	0
6½ bolls of oatmeal, at 20s.	6	10	0
540 Scotch pints of milk, at 2d.	4	10	0
Firing, lodgings, allowances, &c.	5	0	0
Yearly income of a single man,	£30	0	0

Married men have houses with gardens contiguous to, or at no great distance from, the homestead. They have also a plot of potato-ground, and the privilege of keeping a pig. They may have the usual allowance of oatmeal and milk, or more according to agreement. They are generally considered more expensive servants to the farmer than single men, but more steady and care-taking. Both of them are regularly employed for the most part, so that there is not that difference among the incomes of the common labourers as in England: £30 may not therefore be far from a general average for the whole of the agricultural labourers above the age of twenty. Young men and boys under twenty, from the fact that they are generally boarded, or else receive an allowance of oatmeal and milk little short of that of the others, will maintain a higher average than the same class in England. For the same reason so will women. The former we may set down at £16, and the latter at £14 per annum. According to these figures, the following account will exhibit the total expense of manual labour in Scottish agriculture :—

Men, ...	111,504	at £30 =	£3,345,120
Boys, ...	39,854	... 16 =	637,664
Women, ...	18,642	... 14 =	260,988
Total, . . .	170,000		£4,243,772

The income of the Irish agricultural labourer, *bona fide* as such, is pitiably small. In other respects, the manner of hiring by the day or week, and the general mode of treatment, is analogous to that of England, with the exception that no advance of wages is made during high-priced years. Sometimes, although payment of wages is stipulated in cash, yet it is made in potatoes, either by an account-current opened for potatoes, where the annual supply invariably balances to the full the earnings of the labourer, let him be regularly employed or not, or else by a plot of potato-ground on the conacre system. Over a considerable extent of Ulster, and in the neighbourhood of Dublin, wages are estimated at 1s. per day. In other parts of Ulster and the south, 10d.; but 8d., and 6d. are more frequent in the western and southern provinces than 10d.; so that 8d. per day is the highest figure which can be advanced for the average of the whole of the sister country. Some writers have even stated it at the half of this sum; but taking the whole, it only amounts to about £10 per annum when regularly employed. Now, of the 2,000,000, we cannot say that more than the half are regularly employed, and the other 1,000,000 at half time; so that the yearly income of the whole, and the total expense of manual labour in Ireland cannot be estimated at more than £15,000,000, allowing the [illegible] wages to women, boys, and girls, [illegible]

[illegible] *performed.*—

In England and Wales there are estimated to be 13,150,000 acres under aration, exclusive of 150,000 acres of gardens. In Scotland, 3,355,000 acres, exclusive of 35,000 under gardens. In Ireland, 5,748,500, exclusive of 1,500 under gardens.

The management of grass lands consumes a large amount of the labours of the farmer, but the number of acres in this case affords no certain guide as to the measure of quantity in any comparative view. Probably the nearest approximation which we can make to it is to reduce the whole of the grass lands, woodlands, and wastes in each of the three kingdoms to a common level, according to their respective values, and the values of the whole. Thus Mr M'Culloch estimates the value of pasture and woodlands in England at £3, 12s. per acre, and the whole at £61,614,000—this would give 17,000,000 acres of equal quality. In Scotland, pasture and woodland at £3—total pasture, woodland, and waste, £9,000,000, equal to 3,000,000 acres at this value. In Ireland, pastures, &c., at £2, 10s.—total pasture, woodland, and waste, £20,000,000, giving 8,000,000 acres at the annual value of 50s. The whole, according to this estimate, may be tabularly stated thus:—

	Under the plough.	Gardens.	Grass lands, &c.	Total.
England and Wales,	13,150,000	150,000	17,000,000	30,300,000
Scotland, . .	3,355,000	35,000	3,000,000	6,390,000
Ireland, . .	5,748,500	1,500	8,000,000	13,750,000
Total, .	22,253,500	186,500	28,000,000	50,440,000

5°. *The value of the agricultural produce of the three kingdoms* is thus stated:—

	ENGLAND.		
Crops under the plough,	£77,742,857		
Grass lands, &c., . .	61,614,000		
		£139,356,857	
Gardens, . . .		2,250,000	
			£141,606,857
	SCOTLAND.		
Crops under the plough, .	£18,219,286		
Grass, &c., . . .	9,000,000		
		£27,219,286	
Gardens, . . .		525,000	
			£27,744,286
	IRELAND.		
Crops under the plough, .	£28,020,834		
Grass and woodlands, .	20,000,000		
		£48,020,834	
Gardens, . . .		180,000	
			£48,200,834
Sum total, ...			£217,551,977

We have thus arrived at a fruitful field for comparative reflection—more so, we are afraid, than what our limits will admit of being reaped, as will appear from the following examples:—

	Arable acres to each labourer.	Pasture.	Total.
Example 1.—England,	$13\frac{1}{7}$	17	$30\frac{1}{8}$
Scotland,	$19\frac{25}{34}$	$17\frac{11}{17}$	37[illegible]
Ireland,	$2\frac{7}{8}$	4	$6\frac{1}{8}$

	Arable acres to each ploughman.	Pasture.	Total.
Example 2.—England,	50	74	124
Scotland,	50	44	94
Ireland,	26	41	67

	Arable acres to each common labourer.	Pasture.	Total.
Example 3.—England,	30	40	70
Scotland,	159	142	301
Ireland,	7	10	17

	Arable acres to each boy.	Pasture.	Total.
Example 4.—England,	84	109	193
Scotland,	84	77	161
Ireland,	11	16	27

	Arable acres to each woman.	Pasture.	Total.
Example 5.—England,	351	459	810
Scotland,	186	166	352
Ireland,	11	16	27

	Value of the produce of arable acres to each labourer.	Pasture.	Total.
Example 6.—England,	£77 14 9	£61 12 3	£139 7 0
Scotland,	107 3 5	52 18 9	160 2 2
Ireland,	14 0 0	10 0 0	24 0 0

	Labourers.	Wages.	Return.
Example 7.—England,	1,000,000	£27,508,675	£139,356,875
Scotland,	170,000	4,243,772	27,219,286
Ireland,	2,000,000	15,000,000	48,020,834

The foregoing tables fully bear out the truth of what was premised at the commencement of this paper—that a similarity of practice has not yet been established in the three kingdoms sufficiently clear to be recognised as a common index to the state of their agricultural industry; that differences exist, not only at variance with science, but of a character and magnitude effecting the health of the empire—differences, too, not only between the long-degraded sister country and England, but also between England and Scotland. Every labourer of the latter, it will be perceived, returns his employer, from the comparatively poor soil of the north, £20 annually more than do those of the former from the richer soil of he south; and were the fertility of soils equal, the difference would e still greater. But, even as it is, such a difference for each abourer is obviously a national shortcoming, which amounts to a um equivalent to little short of Old England's rent-roll!

n Ireland, again, were the whole of her produce divided among agricultural labourers, allowing nothing for tradesmen's accounts, tithes, rates, and the interest of capital invested by landord and tenant, it would not advance them to a level with those of England. Hence the impropriety of those measures, purely politi-

cal, so generally demanded by Irishmen to alleviate calamities arising from an imperfect state of labour. The elements of national labour are not organised according to science. Instead of subdividing labour Irishmen have subdivided land, than which scarcely anything can be more opposite.

The small farm system of the sister country is purely a remnant of the patriarchal times once enjoyed by all the United Kingdom; and, however well it may harmonise with the natural feelings of man, is unsuitable for him in the artificial state in which he has placed himself; for the infallible sentence, "Cursed is the ground for thy sake," has subjected every son of Adam to labour—the combination and subdivision of which the patriarchal system excludes. Hence, with the progress of science the system has been abrogated in every province of Britain now in the enjoyment of comparative prosperity, and of necessity must be so before industry in a national sense can be established; for the amount of labour required by the small farm system to produce a given effect is much greater than that required by the large. Ireland probably expends four times the quantity of labour in producing from her fertile soil £48,000,000 value of produce, which Scotland does in producing £27,000,000. We found, for instance, two Irishmen at one plough; and setting aside the character of the plough itself—its working order, and the tugging and twisting of the team—we would rather plough the 35 acres out and out, than do the work which devolves upon the ploughman upon the headlands of the small fields of the sister country. At one period of our manufacturing history, one artisan performed the whole manipulations in pin-making, and probably did not finish more than twenty pins daily; now twenty are employed, and these manufacture 5000 each in the same time. It would be useless for any one to open a pin-manufactory single-handed in modern times, on the plea of a want of capital, or to give more employment, as is pleaded by more than small farmers of the sister country in favour of the patriarchal system. No person would make the attempt, much less listen to the plea of a want of capital or an increase of employment in the making of a given number of pins. Yet why is it attempted, practised, and pleaded in agriculture? Simply because the science of labour is less understood in that art than in that of pin-making, and other arts, where labour is subdivided.

It may be said that the subdivision of land, instead of labour, in a national sense, cannot be pleaded as the reason why the agricultural industry of England falls so far short of that of Scotland. Granted; but there may be other patriarchal customs to which her farmers may cling with as much pertinacity as an Irishman to a conacre—customs on which our limits, as well as the subject, will only at present admit of a few remarks in conclusion.

England at one period, doubtless, shot far ahead of Scotland in

agriculture, and continued to keep in advance until towards the end of the last century, when in an unpropitious hour she appears to have undervalued the proud position she was qualified to maintain, and to have fallen considerably behind her northern sister in the practice of this parent art. The energies of her people appear as if they had been engrossed in the commercial enterprise and the mental movements of this extraordinary period of her history. Her conquests, and territorial extent of dominions abroad, eclipsed from her view the more important value of her fields at home; and the first and noblest of the arts—that upon which all others depend—was seemingly acknowledged by her proprietary interest as of secondary consideration. Late years, however, have wrought a visible change for the better, and England is now agăin making laudable efforts to advance. There cannot be a doubt that, at the period we write, farms in England, and also in Ireland, are equally well cultivated as any in Scotland, and that the three kingdoms, once divided, but now united, are prepared to go forward together in the march of agricultural improvement, as in every other branch of national industry. The science of labour will reduce the same principles to practice in the one country as in the other—the same economy and subdivision of labour may be studied in England, Scotland, and Ireland. The size of farms, mode of husbandry, and management of labourers, with their domestic economy, will be reduced, comparatively speaking, to a common level. Others than the agricultural labourers of each, however much they may yet show vestiges of former diversity, are fast approximating to a general uniformity of national appearance, language, manners, customs. In this they are assisted by the progress of science —by the power of steam-navigation and railways, and the facilities which those conveyances afford to society for commingling together, and exchanging sentiments upon all subjects of national interest. No doubt in England, among the lower classes more especially, the Scotch are still regarded with considerable jealousy and suspicion—partly, perhaps, because of their numbers, and partly because of their preferment to many lucrative situations of trust and responsibility; while in Scotland, in like manner, the English settlers are looked upon with dissatisfaction; and no doubt, too, the English and Scotch who have become resident in Ireland; while others, who are surveying her patriarchal holdings with an eagle's eye, are equally considered as unwelcome intruders. Yet these are the natural beginnings, and even more than beginnings, of the dissolution of national differences—of the repeal of parchment unions, and of the blending together into one mighty people three great nations, long disunited, even in union, through the uncivilisation of their common nature.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON

Date.	Wheat s.	Wheat d.	Barley s.	Barley d.	Oats s.	Oats d.	Rye s.	Rye d.	Pease s.	Pease d.	Beans s.	Beans d.
1850.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 2.	44	1	26	5	17	8	22	8	27	3	24	10
9.	42	10	26	7	17	6	23	1	27	1	25	0
16.	41	3	24	10	16	10	23	4	28	1	24	10
23.	40	10	24	7	16	7	23	0	26	8	26	2
Mar. 2.	42	7	25	3	17	1	21	2	26	3	24	11
9.	41	11	25	6	16	8	21	4	26	1	25	3
16.	41	10	25	7	16	0	21	9	25	9	26	0
23.	42	5	24	4	16	7	22	5	25	1	24	5
30.	42	5	25	7	16	5	23	0	26	7	24	2
Apr. 6	42	10	23	11	16	6	22	8	25	11	23	1
13.	43	11	24	2	16	6	22	0	26	10	23	3
20	42	4	23	11	16	4	22	0	25	1	22	10
27.	42	2	22	4	16	6	21	11	27	0	22	8
May 4.	41	8	22	6	16	4	21	9	26	8	22	9
11	41	4	22	10	16	3	20	6	25	5	22	6
18.	42	4	23	2	15	11	20	0	25	4	26	0
25.	44	7	24	0	16	1	22	10	26	1	27	6

EDINBURGH.

Date.	Wheat s.	Wheat d.	Barley s.	Barley d.	Oats s.	Oats d.	Pease s.	Pease d.	Beans s.	Beans d.
1850.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 6.	35	5	20	11	17	2	25	0	25	6
13.	35	6	21	2	17	3	24	6	24	11
20.	35	8	21	3	16	11	25	6	26	0
27.	36	1	21	9	16	7	26	6	26	10
Mar 6.	36	6	21	10	18	2	27	0	27	5
13.	37	5	22	2	18	9	27	6	27	10
20.	37	4	22	4	19	2	26	6	26	10
27.	38	3	23	1	18	5	25	10	26	2
Apr. 3.	37	5	23	0	17	9	26	0	26	3
10.	37	9	22	5	17	10	25	6	25	10
17.	37	0	23	3	18	2	25	6	25	11
24.	36	8	22	10	17	9	24	4	24	8
May 1.	37	6	22	0	17	7	25	2	25	7
8.	37	9	22	7	17	10	25	6	26	1
15.	39	7	23	8	18	8	27	1	27	7
22.	30	6	24	2	19	8	26	6	29	0
29.	39	1	23	0	21	4	28	7	29	1

LIVERPOOL.

Date	Wheat s.	Wheat d.	Barley s.	Barley d.	Oats s.	Oats d.	Rye s.	Rye d.	Pease s.	Pease d.	Beans s.	Beans d.
1850.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 2	40	9	24	10	16	11	22	4	28	11	26	1
9.	37	9	24	9	17	1	23	6	28	2	25	5
16.	38	8	23	8	17	9	22	10	27	6	29	12
23.	38	4	23	4	18	4	23	3	28	0	25	11
Mar 2.	38	1	23	7	16	11	23	8	26	6	26	3
9.	36	4	23	5	16	5	24	6	27	2	25	4
16.	38	9	23	4	15	8	30	2	26	4	24	5
23.	37	3	22	9	16	0	28	4	26	1	27	6
30.	37	7	22	11	16	1	25	1	25	9	23	5
Apr. 6.	38	6	23	6	14	10	24	0	25	6	24	3
13	38	0	23	2	15	9	23	6	25	0	23	2
20	37	9	23	6	17	0	22	9	25	2	24	6
27	35	8	24	0	15	3	22	6	25	10	26	10
May 4.	36	6	24	6	15	1	22	10	26	0	25	1
11	38	10	24	8	14	2	23	4	25	4	23	8
18	39	8	23	10	14	4	23	0	24	6	26	2
25.	39	5	21	10	16	7	23	6	25	2	27	0

DUBLIN

Date.	Wheat, p. barl. 20 st. s.	d.	Barley, p. barl. 16 st. s.	d.	Bere, p. barl. 17 st. s.	d.	Oats, p. barl. 14 st. s.	d.	Flour, p. barl. 9 st. s.	d.
1850.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 8.	21	0	11	7	10	8	9	6	14	11
15.	21	1	11	5	10	6	9	5	14	10
22	21	4	11	3	10	8	9	6	14	9
Mar. 1.	21	6	11	0	10	2	9	4	15	0
8.	21	1	11	4	10	1	9	9	14	10
15	20	10	11	6	9	11	9	11	14	8
22.	21	4	11	9	10	2	9	7	14	6
29.	21	3	11	3	9	10	10	3	14	7
Apr. 5.	21	11	10	10	9	8	10	1	14	8
12.	21	9	10	9	9	11	10	4	14	7
19.	21	7	10	8	10	3	10	1	14	6
26	21	10	10	10	10	1	10	3	14	6
May 3.	21	9	11	1	10	6	10	6	14	7
10.	21	11	11	4	10	8	10	6	14	8
17	22	2	11	7	10	7	10	4	15	0
24.	23	1	11	2	10	9	10	11	15	6
31.	22	5	11	5	10	6	11	9	15	2

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat Weekly Average s.	d.	Wheat Aggregate Average s.	d.	Barley Weekly Average s.	d.	Barley Aggregate Average s.	d.	Oats Weekly Average s.	d.	Oats Aggregate Average s.	d.	Rye Weekly Average s.	d.	Rye Aggregate Average s.	d.	Pease Weekly Average s.	d.	Pease Aggregate Average s.	d.	Beans Weekly Average s.	d.	Beans Aggregate Average s.	d.
1850.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 2.	39	4	40	2	25	4	25	11	15	2	15	8	23	10	23	6	27	0	28	2	25	6	26	5
9.	38	6	40	0	24	7	25	6	15	3	15	7	22	1	23	2	26	4	27	8	25	3	26	2
16.	37	5	39	6	23	10	25	4	15	4	15	6	20	7	22	6	26	10	27	5	24	11	25	9
23.	37	11	39	1	23	7	24	11	15	6	15	6	20	11	22	1	26	0	27	0	24	8	25	6
March 2.	38	6	38	8	23	9	24	6	14	11	15	4	21	11	21	9	25	11	26	9	24	4	25	1
9.	38	6	38	5	23	10	24	2	15	5	15	3	23	3	22	1	25	4	26	3	24	7	24	10
16.	38	1	38	3	23	6	23	10	14	11	15	3	22	7	21	11	25	2	25	11	24	1	24	8
23.	37	8	38	1	23	4	23	8	15	2	15	3	23	5	22	1	25	2	25	9	23	11	24	5
30.	37	9	38	1	23	6	23	7	15	2	15	2	21	7	22	3	25	3	25	6	23	10	24	3
April 6.	38	1	38	1	23	2	23	6	14	10	15	1	21	6	22	4	24	5	25	3	23	8	24	1
13.	38	6	38	1	22	11	23	5	15	3	15	1	20	6	22	3	26	3	25	3	23	9	24	0
20.	37	10	38	0	22	6	23	2	15	3	15	1	21	6	21	11	24	9	25	6	23	9	23	10
27.	37	1	37	10	22	1	22	11	15	0	15	1	21	6	21	9	25	1	26	2	23	8	23	9
May 4.	36	11	37	4	22	0	22	5	14	7	15	0	19	11	20	11	24	9	25	0	23	11	23	11
11	38	0	37	1	21	0	22	6	15	8	15	0	19	1	20	9	24	9	25	0	24	8	23	11
18.	39	7	38	0	22	5	22	4	15	5	15	1	21	7	20	8	24	11	26	1	25	6	24	3
25.	40	7	38	4	22	10	22	4	16	3	15	3	22	4	21	0	25	6	25	0	26	4	24	8

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1850.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Feb.	Danzig	32 6 - 36 0	11 6 - 14 0	9 0 - 13 0	14 6 - 18 6	16 0 - 20 6	17 0 - 23 0
March	Danzig	31 0 - 36 6	11 0 - 14 6	9 6 - 14 0	14 0 - 17 6	17 6 - 22 0	17 6 - 24 0
April	Danzig	32 0 - 38 0	10 6 - 13 6	10 0 - 14 6	15 0 - 18 0	18 0 - 23 0	18 0 - 24 0
May	Danzig	34 0 - 42 0	10 6 - 13 0	9 0 - 13 0	16 0 - 19 0	18 6 - 20 6	17 0 - 22 6
Feb.	Hamburg	34 0 - 39 0	15 0 - 20 9	11 0 - 15 0	14 6 - 20 0	18 0 - 24 0	18 6 - 24 6
March	Hamburg	33 6 - 38 6	16 0 - 23 0	11 6 - 15 6	16 0 - 22 0	17 0 - 23 0	18 0 - 24 0
April	Hamburg	32 0 - 38 0	17 0 - 23 0	12 0 - 16 0	15 0 - 21 0	16 0 - 22 6	16 6 - 23 0
May	Hamburg	34 0 - 42 0	17 6 - 24 0	13 0 - 17 0	16 6 - 23 0	16 6 - 24 0	17 0 - 23 6
Feb.	Stettin	31 6 - 37 6	14 0 - 17 0	9 0 - 12 0	13 6 - 16 6	16 6 - 23 0	15 6 - 22 0
March	Stettin	30 0 - 36 0	13 6 - 16 6	9 6 - 12 6	13 6 - 17 0	17 6 - 24 0	16 6 - 23 6
April	Stettin	32 0 - 38 0	12 6 - 16 0	9 0 - 12 0	14 0 - 18 0	16 0 - 21 0	16 0 - 22 0
May	Stettin	31 6 - 37 6	12 6 - 16 6	9 0 - 12 6	14 6 - 20 6	16 6 - 22 6	16 0 - 21 6
Feb.	Königsberg	30 9 - 36 6	12 0 - 15 6	8 6 - 11 6	14 0 - 17 0	15 0 - 19 6	15 6 - 20 6
March	Königsberg	29 6 - 34 6	11 6 - 14 3	9 0 - 12 0	13 6 - 16 6	15 6 - 18 0	16 0 - 19 6
April	Königsberg	30 6 - 36 6	11 9 - 14 6	8 6 - 11 6	12 9 - 16 0	16 0 - 18 6	16 6 - 20 0
May	Königsberg	32 6 - 38 6	12 0 - 15 6	8 6 - 10 6	13 6 - 17 3	16 0 - 19 0	16 6 - 19 6

Freights from the Baltic from 2s. 10d to 3s 6d; and from the Mediterranean, from 5s. to 7s. 6d.

THE REVENUE.—From 5th April 1849 to 5th April 1850.

	Quarters ending April 5. 1849.	Quarters ending April 5. 1850.	Increase.	Decrease.	Years ending April 5. 1849.	Years ending April 5. 1850.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs ..	4,593,119	4,432,548	..	160,535	19,129,829	18,585,263	..	394,566
Excise.... ..	1,820,575	1,850,473	38,868	.	12,650,114	12,792,713	142,599	..
Stamps . .	1,549,171	1,538,125	.	11,046	6,041,351	6,354,429	313,078	..
Taxes .	148,101	177,231	29,130	.	4,318,903	4,332,979	14,076	..
Post-Office	234,000	231,000		3,000	789,000	803,000	14,000	..
Miscellaneous	138,792	87,960		50,833	243,651	350,410	114,759	..
Income Tax	2,011,519	2,069,608	58,089	..	5,317,244	5,466,248	149,004	..
Total Income	10,495,277	10,386,945	126,107	225,413	48,490,098	48,685,042	747,516	394,566
	Deduct Increase on the qr			126,107	Deduct Decrease ...		394,566	
	Decrease on the qr. .. .			99,306	Increase on the year		352,950	

TABLES OF BUTCHER MEAT Per Stone of 14 Pounds.

Date.	London Beef.	London Mutton.	Liverpool Beef.	Liverpool Mutton.	Newcastle Beef.	Newcastle Mutton.	Edinburgh Beef.	Edinburgh Mutton.	Glasgow Beef.	Glasgow Mutton.
1850.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Feb.	5 3 - 6 6	5 6 - 6 6	5 0 - 6 9	5 3 - 6 9	5 0 - 6 6	4 9 - 6 6	5 0 - 6 6	5 3 - 6 6	5 6 - 6 6	5 3 - 6 6
March	5 0 - 6 6	5 9 - 7 3	4 9 - 6 6	5 0 - 6 3	4 9 - 5 6	4 0 - 5 6	5 3 - 6 9	5 3 - 6 9	5 6 - 6 9	5 3 - 6 9
April	5 0 - 6 3	5 6 - 7 6	4 9 - 6 3	4 9 - 6 3	4 6 - 5 6	4 9 - 5 6	5 3 - 6 6	5 3 - 6 6	5 6 - 6 9	5 0 - 6 9
May	5 0 - 6 6	5 6 - 6 9	4 9 - 6 3	4 9 - 6 3	4 6 - 6 0	4 6 - 5 9	5 3 - 6 3	5 3 - 6 6	5 3 - 6 6	5 0 - 6 6

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

ENGLISH.	s. d. s. d.	SCOTCH.	s. d. s. d.
Merino,	11 6 to 17 6	Leicester Hogg,	9 6 to 15 6
in grease,	9 0 to 13 0	Ewe and Hogg,	8 6 to 12 0
South-Down,	12 6 to 17 6	Cheviot, white,	7 6 to 11 6
Half-bred,	10 0 to 15 0	Laid, washed,	6 6 to 9 0
Leicester Hogg,	10 6 to 16 0	unwashed,	5 0 to 7 9
Ewe and Hogg,	8 6 to 12 6	Moor, white,	5 6 to 7 6
..cks,	6 0 to 8 0	Laid, washed,	4 3 to 5 6
..por,	5 3 to 6 9	unwashed,	3 9 to 5 3

[FI]ARS PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1849, by the Imperial Measure.

ABERDEEN.

	Imp. qr.
[W]ithout fodder	33/2
[wit]h fodder	
[w]ithout fodder	20/
[wi]th fodder	25/
[...]t, without fodder	18/
with fodder	23/
[...]nd, without fodder	16/
with fodder	21/8
[Pot]ato, without fodder	13/6
—— with fodder	19/6
[Com]mon, without fodder	13/
— with fodder	19/
	23/6
	20/
[...] included	42/
[Oatmeal,] per 140 lb.	11/4

ARGYLE.

	36/6
	22/8
	21/
	16/6
	27/8
[Oatmeal,] per 140 lb.	13/3

AYR

	35/0¼
	21/10½
	20/2¾
	14/1½
	24/
	26/9½
[Oatmeal,] per 140 lb.	12/7¾

BANFF.

	36/8
[w]ithout fodder	19/6
[w]ith fodder	23/6
[with]out fodder,	16/5
—— with fodder	20/5
[Pot]ato, without fodder	15/3
—— with fodder	21/9
[Com]mon, without fodder	13/3
—— with fodder	19/9
	20/6
[Oatmeal, p]er 140 lb.	11/1

BERWICK.

	35/0 $\frac{4}{12}$
[K]erse	18/4 $\frac{4}{12}$
[La]mmermuir	17/9
[Ker]se	15/8 $\frac{6}{12}$
[Lam]mermuir	14/2 $\frac{1}{12}$
	24/
[Oatmeal,] per 140 lb.	12/7 $\frac{8}{12}$

BUTE.

	34/8¾
	20/4¾
	18/10½
	17/2
[Oatmeal, p]er 140 lb.	12/11¼

CAITHNESS.

	14/1¼
	17/1¾
[Pot]ato	
[...]s	14/
[...]ly	14/
[Oatmeal,] per 140 lb.	12/1

[C]LACKMANNAN.

	34/7 $\frac{6}{12}$
[K]erse	22/10 $\frac{6}{12}$

CLACKMANNAN (Continued.)

	Imp. qr.
Barley, Dryfield	21/3 $\frac{7}{12}$
Oats, Kerse	15/8
—— Dryfield	15/2 $\frac{3}{12}$
Pease and Beans	24/1 $\frac{1}{12}$
Malt	43/11 $\frac{9}{12}$
Oatmeal, per 140 lb.	12/3 $\frac{4}{12}$

DUMBARTON.

Wheat	36/9
Barley	21/2
Bere	19/
Oats	17/1
Pease and Beans	29/9
Oatmeal, per 140 lb.	13/6

DUMFRIES.

Wheat	39/8
Barley	22/2
Bere	21/6
Oats, Potato	16/2
—— Common	15/3
Rye	26/8
Pease,	
Beans	30/6
Malt	60/
Oatmeal, per 140 lb.	12/1

EDINBURGH.

Wheat, First	33/6
—— Second	30/
Barley, First	20/9
—— Second	18/
—— Third	16/
Oats, First	16/5
—— Second	15/
Pease and Beans	24/8
Oatmeal, per 112 lb.	9/7
—— 280 lb.	23/11½

ELGIN AND MORAY.

Wheat	37/5
Barley	20/1
Oats	15/4
Rye	22/
Oatmeal, per 112 lb.	10/7

FIFE.

Wheat, White	33/0½
—— Red	29/3¼
Barley	19/6½
Bere	17/6¼
Oats	15/0¼
Rye	20/0¾
Pease and Beans	21/2¼
Malt	44/2¼
Oatmeal, per 112 lb.	9/6¼
—— 280 lb.	23/11

FORFAR.

Wheat	34/11
Barley	18/4
Bere	16/5
Oats, Potato	15/3
—— Common	14/8
Rye	18/6
Pease and Beans	22/2
Oatmeal, per 140 lb.	11/

HADDINGTON.

Wheat, First	40/3¾
—— Second	36/11½
—— Third	34/11
Barley, First	24/0½
—— Second	22/5¼
—— Third	20/2¾
Oats, First	19/3¾
—— Second	17/11
—— Third	16/6¼

INVERNESS.

	Imp. qr.
Wheat, without fodder	36/1
—— with fodder	41/1
Barley, without fodder	18/6
—— with fodder	22/6
Bere, without fodder	16/9
—— with fodder	20/9
Oats, without fodder	15/1
—— with fodder	20/7
Oatmeal, per 112 lb.	11/2

KINCARDINE.

Wheat, without fodder	34/3
—— with fodder	43/5½
Barley, without fodder	17/10½
—— with fodder	23/10½
Bere, without fodder	16/4½
—— with fodder	22/4½
Oats, Potato, without fodder	14/3
—— with fodder	21/3
—— Common, without fodder	14/7
with fodder	21/1
Pease, without fodder	21/0¾
—— with fodder	28/0¾
Beans, without fodder	21/0¾
—— with fodder	29/0¾
Oatmeal, per 140 lb.	11/6¾

KINROSS.

Wheat	31/10
Barley, First	19/9
—— Second	17/9
Oats, First	14/7
—— Second	13/2
—— Average	13/11
Pease	24/
Oatmeal, per 280 lb.	25/7½

KIRKCUDBRIGHT.

Wheat	37/4
Barley	21/10
Oats, Potato	15/10
—— Common	14/2
Oatmeal, per 140 lb.	11/6

LANARK.

Wheat, First	36/10½
—— Second	34/6
—— Third	33/10
Barley, First	18/5½
—— Second	16/6
Bere, First,	16/8
—— Second	14/8
Oats, First	16/3
—— Second	14/4½
Pease, First	27/3
—— Second	
Beans, First	
—— Second	
Malt	40/5 $\frac{4}{12}$
Oatmeal, First, per 140 lb.	12/5 $\frac{1}{12}$
—— Second	10/5 $\frac{7}{12}$

LINLITHGOW.

Wheat	34/6
Barley	21/10
Oats	15/7
Pease and Beans	25/7
Malt	43/6
Oatmeal, per 112 lb.	10/1
—— 140 lb.	12/7

NAIRN.

Wheat	37/10
Barley, without fodder	19/6
—— with fodder	24/6
Oats, without fodder	15/10
—— with fodder	22/4
Oatmeal, per 112 lb.	10/10

FIARS PRICES—*Continued.*

ORKNEY.

	Imp. qr.
Bere, per 360 lb.	13/
Malt, per 140 lb., with duty	16/10
—— per 140 lb., without duty	8/
Oatmeal, per 140 lb.	11/

PEEBLES.

Wheat,	32/
Barley, First	20/1½
—— Second	18/8¾
—— Third	17/2¾
Oats, First	15/0¾
—— Second	13/10½
—— Third	11/4¾
Pease and Beans, First	25/2
Oatmeal, per 140 lb. First,	12/2
—— Second	11/8¾
—— Third	11/3

PERTH.

Wheat, First	34/9
—— Second	27/
Barley, First	19/4
—— Second	14/6½
Oats, First	15/2½
—— Second	12/6½
Rye	20/6
Pease and Beans	21/4
Oatmeal, per 140 lb.	11/7

RENFREW.

Wheat, First	35/7¾
—— Second	35/2¼

RENFREW (*Continued.*)

	Imp. qr.
Barley, First	23/3¼
—— Second	21/9¾
Bere, First	21/4
—— Second	20/3½
Oats, First	17/9¾
—— Second	16/10½
Beans, First	28/1
—— Second	27/1½
Oatmeal, per 140 lb. First	13/2¾
—— Second	13/1¾

ROSS AND CROMARTY.

Wheat, First	34/11
—— Second	33/11
Barley	19/6½
Bere	17/5½
Oats	16/9¾
Pease	24/10
Beans	24/10
Malt	46/8½
Oatmeal, per 140 lb.	10/1

ROXBURGH.

Wheat	36/1 $\frac{5}{12}$
Barley	19/4 $\frac{6}{12}$
Oats	14/9 $\frac{1}{12}$
Rye	
Pease	24/4
Beans	24/11 $\frac{3}{12}$
Oatmeal, per 140 lb.	11/8

SELKIRK.

Wheat	
Barley	
Oats, Potato	
—— Common	
Pease	
Oatmeal, per 280 lb.	

STIRLING.

Wheat	
Barley, Kerse	
—— Dryfield	
Oats, Kerse,	
—— Dryfield	
—— Muirland	
Pease and Beans	
Malt	
Oatmeal, per 140 lb.	

SUTHERLAND.

Wheat	
Barley	
Bere	
Oats	
Pease	
Oatmeal, per 140 lb.	

WIGTOWN.

Wheat	
Barley	
Bere	
Oats, Potato	
—— Common	
Rye	
Pease	
Beans	
Malt	
Oatmeal, per 280 lb.	

We may inform our English readers, that Fiars Prices are the average prices of grain, as ascertained every year, by the verdict of Juries, in every County of Scotland. The Juries are summoned in spring, and ascertain, from the evidence produced to them, the average prices of the preceding crop. By these prices, rents payable in grain, and similar contracts, are generally determined; but the main object is to convert into money the stipends (for the most part fixed at a certain quantity of grain) of the Scottish Clergy.

THE LATE JAMES SMITH OF DEANSTON.

Few men have laboured more earnestly in the great field of physical improvement, or have better merited the often abused name of a philanthropist, than the late lamented James Smith of Deanston. Sanguine and self-relying as he was acute and fertile in invention, his genius for reforming the material condition of his fellow-beings had in it all the fervency and power of a ruling passion, and often enabled him to bear down opposition, or to surmount difficulties in the accomplishment of his purpose, which would have discouraged or altogether deterred men of equal talent who were either less resolute or of colder temperament. Sprung from a hardy race—blessed with a sound and vigorous constitution—quick of eye and ready of hand—his person scarcely reaching to the middle height, but strongly built—broad-chested and muscular—he seemed admirably adapted by nature to struggle with the inert and ungenial elements of the outward world; and against these, throughout his whole life, he waged successful war. To diminish and ameliorate the hardships of labour, to banish from the physical world all that is found inimical to the comfort and the progress of his kind, was frankly recognised by him as his vocation here upon earth; and in it he worked manfully early and late, in season and out of season, doing more than yeoman service. For this good end he seemed to live, and move, and have his being; and as to the ear of the poet there is music in the lowest murmur of the brook, and to the eye of the spiritual philosopher a visible Deity in the golden hues of morning, so to his ear, and eye, and apprehension, every movement of nature—the streams, the waves, the breezes—seemed suggestive of some hidden, yet accessible means by which God's power might be better used for man's advantage, and her quietest aspect to hint at some hitherto unthought-of process by which the precious treasures of her bosom might be taught to flow out yet more freely and more abundantly, for the good and the happiness of the increasing race of man.

As it is to great practical men like Mr Smith we must continue to look for assistance, not only in our own peculiar field—the evolution of new views affecting the agricultural interests of our country, but also for those general physical improvements which lie at the root of all social progress—we cannot, as we conceive, better employ a few of the pages of this Journal than in giving a brief sketch of the life and labours of one to whom the country owes so large a debt of gratitude.

Mr Smith was born at Glasgow on the 3d of January 1789, and in the middle station of society. His father (whom he lost in infancy) was a respectable merchant of that city, and his mother, the daughter of James Buchanan of Careston, a landed proprietor in the western part of Stirlingshire. He was one of three children,

(two sons and a daughter;) and though anxiously brought up by a widowed mother, his youth was neither spoilt nor sickly. By nature a lively and active boy, and very early observant and intelligent, far beyond his years, his sound health and affectionate disposition seem to have preserved him from the evils of precocity and over-indulgence, usually so dangerous to a child so circumstanced.

His mother's younger brother, Archibald Buchanan, (afterwards of Catrine,) was, at the time of the elder Smith's death, the managing partner of extensive cotton-works at Deanston, near Doune, in Perthshire. This gentleman had, in early youth, been a pupil of the famous Arkwright; and though without the ambition, or, it may be, the power of popularising his views and discoveries, which was afterwards so eminently possessed by his more celebrated nephew, was a man of perhaps still more original and solid practical ability, and had preceded him, not only in the practice of thorough draining, but in the invention of the self-acting mules and carding and other machines, which Mr Smith afterwards brought to greater perfection, and into more general use. With him the widow and her children found a happy home at Deanston, and, in after life, Mr Smith often acknowledged his many obligations to this excellent uncle; and in an interesting sketch of his own career, given by himself on one occasion, characterises him as "a man of singular genius, sound judgment, and great application and perseverance."

It is always interesting to note how early in life those traits of temper, disposition, and genius are manifested, which afterwards, in any marked degree, characterise the man. We are told that, from his earliest years, James Smith was a bold, ardent boy, full of life and activity, as eager to obtain as he was ready to bestow; sometimes over-hasty and rash, but rarely selfish, and never either false or malicious. He says, in the sketch above alluded to, "The natural tendency which has determined my course in life seems to have taken possession of my mind at a very early period, for I have been told that, when only a few years old, on being asked what trade I should like to follow, I replied that 'I would have a cotton-mill, and keep a farmer laddie.'" His skill in rearing animals is also said to have been indicated almost in infancy. "At six years old he was a great breeder of pigeons; and his habit of observation led him to discover the peculiarities of colour and of structure which marked the descent through several generations, distinguishing in an individual those features which corresponded with the race, and those which were irregular or accidental." All this proves how very much, in his case, "the child was father to the man."

At seven years of age he went to school in Glasgow, and afterwards attended college there, making a respectable figure at both. He studied mathematics at a private school, and was rather distinguished as a mathematician. He was fond of chemistry, and was

very early familiar with many of the details of chemical as well as mechanical science. While at the university, he paid little attention to moral philosophy or to political economy, his interest in either being as yet unawakened. It was not till in after-life, when his intellect was more fully developed, and the want felt of guiding principles, that he became aware of the high importance of these great sciences—not only as affording admirable exercise for the mind of man, or even of enabling him better to understand and apply his own powers, but as the best expositors of those ennobling, practical truths, the knowledge of which, by convincing man that happiness cannot dwell apart from virtue, nor idleness and improvidence go long unpunished, must tend most forcibly to his advancement as an intelligent and moral agent.

His university holidays were all spent with the uncle above alluded to, Mr Archibald Buchanan, who had before that time removed to the Catrine Works, in Ayrshire. Here he entered practically into the study of mechanics and engineering, and made himself thoroughly master of all the nice details of cotton-spinning. His holiday time was not, however, entirely devoted to the cotton-factory and the machine-shop. His uncle was a spirited farmer as well as a successful manufacturer; he farmed about two hundred acres of his own property, and in this field also the apt nephew was soon following his footsteps. In alluding to these days, he says, "As a recreation from his laborious occupations, Mr Buchanan amused himself in the study and practice of agriculture. From him I imbibed a desire for this interesting study, and received much of my knowledge of its principles from the ideas which were constantly flowing from his powerful mind. Whilst in Ayrshire with him, learning to be a spinner and mechanician, I had the advantage of his example and instructions, which was most invaluable to me."

As a substantial proof of the confidence with which his ability and judgment had already inspired those who had the best opportunities of judging of him, Mr Smith was, at the early age of eighteen, appointed to the management of the Deanston Works, at that time repurchased by the firm of which his uncle had become a partner. Another of the partners of this respectable company was that enlightened and liberal merchant, and excellent man, the late Mr Kirkman Finlay, who was, through life, one of Mr Smith's best and most highly valued friends. Here Mr Smith had, for a time, abundant occupation in regenerating and again bringing into full operation a dilapidated and long-neglected work. But his energies were admirably adapted to the task, and it was not long before he had collected and trained, in the various departments of the business, an almost unrivalled band of work-people. The distinguishing peculiarity of his disposition now began clearly to manifest itself. Long before the new village of Deanston was built, in the construction of which, like a careful father of his children, he after-

wards carried his plans for the accommodation of his people almost to perfection, Mr Smith had shown a benevolent interest in the physical comfort as well as the moral training of the work-people under his charge. He encouraged neatness of dress and cleanliness in their dwellings, made beneficial alterations in the system of education among the young, and in the manners and moral bearing of all, and promoted the practice of athletic games and sports in the hours of leisure and relaxation.

When he had thus, in a great measure, reorganised the Deanston Works, and had satisfied himself that his attempts at improvement in the management of the people under his charge were working satisfactorily, he found leisure to turn his attention to his favourite pursuit of agriculture. He became a member of the Gargunnock Farmers' Club, and associated much with his neighbouring agriculturists.

One of his first inventions, and the very first which attracted public attention, was that of a machine for reaping corn, which, though he never succeeded in making it absolutely fit for general use, was a clever idea, ingeniously worked out. Having tried the machine first in the form of a working model, he, in 1812, made a larger one, to be worked by one horse and one man, to compete for a premium of £500 offered by the Dalkeith Farmers' Club for an effective reaping-machine. It cut the corn very neatly; but as it was evidently too weighty for one horse to work, the judges refused to award him the premium, but encouraged him to make another attempt. This he did in 1813, when he produced a beautiful machine, worked by two horses, and guided by one man. But even this, though more perfect in all its parts, was not entirely successful. It was put to work on the home-farm of the Duke of Buccleugh, but after cutting a few ridges in an excellent manner, it unfortunately fell into a sudden hollow, and the cutter having stuck fast in the ground, some part of the wheel-work was broken. The judges again refused to award the premium, but the Club presented Mr Smith with a fifty guinea piece of plate, with an inscription, bearing that it was given him for his meritorious *endeavours* to invent a machine for reaping corn. The Highland Society afterwards appointed a committee of their number to inspect the machine [illegible]n Perthshire; and there it was exhibited cutting oats, beans, barley, [illegible]nd wheat [illegible] very perfect manner; and the Committee reported [illegible] it in ter[illegible] favourable that the Society presented Mr Smith [illegible]h a ha[illegible] plate. Some time afterwards, a model of [illegible]ne mach[illegible] St Petersburg, and Mr Smith received [illegible]rom the Empero[illegible]ssive gold medal, transmitted through the [illegible]ussian amb[illegible] But, after all, the machine fell into disrepute [illegible] proper preparation of the ground; and we only men- [illegible] because Mr Smith never lost confidence in this invention, [illegible] that [illegible] his plan of draining became general—which

would allow the ground to be laid down flat, without ridges or furrows—the reaping-machine would eventually be brought into general use.

By the purchase of the Deanston estate and an arrangement with a neighbouring proprietor, the Company had acquired a great additional fall of water. To take advantage of this new power, Mr Smith constructed a new and extensive wear on the river Teith, from whence he conducted the water to the works by a water-course or canal, of about a mile in length, cut along the bank of the river, and large enough to have floated a ship of considerable burden. To contain the water-wheels and machinery necessary to occupy this power, a large quadrangular building was designed, in the centre of which a water-wheel house was to be placed capable of containing 8 water-wheels working together, the size of each wheel being 36 feet in diameter and 12 feet in breadth, and the entire power 800 horses. Only a part of this majestic work, however, has as yet been executed, consisting of part of one side of the quadrangle, and 4 of the enormous water-wheels—equal to 400 horses. As a great outlay of capital in new machinery was necessary to occupy this immense power, it was of the utmost importance that it should be of the best construction. To secure this, while the buildings and larger works were in progress, he occupied himself in making experiments on the best machines then in use; and, with the assistance of an extensive and efficient establishment of mechanics, many highly useful improvements were effected, and adopted in the new machinery.

In the course of the experiments made at this time, Mr Smith worked out and patented his improved self-acting mule, which has been more generally used, and, as we believe, a source of greater profit to the firm with which he was connected than any other of his most ingenious inventions. The expense of bringing it out, however, was very great; and as much time was lost before it was got into profitable employment, Mr Smith believed himself fairly entitled to a renewal of the patent for seven years. The Privy Council, unfortunately, thought and decided otherwise; and, we regret to say, the refusal was a subject of disappointment and annoyance to him in the last days of his life.

It would be impossible, within our narrow limits, to speak particularly of all the works done at Deanston during the next few years of Mr Smith's active life. To one or two of the most interesting of these, however, we shall briefly allude.

The Deanston Wear, on the river Teith, though serving admirably the purpose for which it was designed, from being upwards of 9 feet in height, offered a serious obstruction to the salmon in going up the river to spawn. To obviate this, the dam was originally constructed with a long sloping channel at one side, having an inclination of about 1 foot in 12. It was found, however, from the

smoothness of this channel, that the water gained an equal ve in its descent through it, with that flowing over the steeper pa the dam; and that, when there was sufficient water to perm fish to swim up, the current was so strong that few if any fish found able to overcome it. This soon became a subject of plaint to the tacksmen of the upper fishings, and again called the ingenuity of Mr Smith, who then devised and set in ope the famous Deanston salmon-ladder, which was perfectly succ there, and has since been adopted (with slight modification many similar wears, on the Clyde, the Don, and other rivers.

The ladder consists of two longitudinal beams placed alon sides of the long sloping channel above mentioned, with cross or steps fixed to the bottom at distances from each other o 10 feet. These break the force of the current and form a s sion of pools and eddies, from one to another of which the s can pass easily, and rest on their way upwards. It is a curiou that although the cross-steps are in themselves only 14 inc depth, and only extend alternately about two-thirds across the br of the ladder, so effectual are they in producing eddies, that s have been frequently observed resting in them at various along the ladder, and passing upwards into the dam, when the a flood of 30 inches deep flowing over its breast; at which tin course, without these helps, they could never even have ma attempt.

As may be supposed, in any difficult or important case occurred in his own neighbourhood, the services of Mr Smith- all his readiness and ingenuity—were found to be of the first On one occasion the Gargunnock road trustees, who had mad unsuccessful attempts to carry a bridge and road over a small s —a tributary of the Forth—applied to him for assistance. foundations of the bridge had been laid in a bog or quagn great depth, and Mr Smith, by putting down a cylindrical culvert, 12 feet in diameter, supported by planking laid o surface, and balancing it by carefully carrying up the em ments on either side during its construction, so as to mainta equilibrium on the surface, most ingeniously and succes delivered them from their difficulties.

In these years Mr Smith's time was very fully occupied had taken into his own hands a large extent of poor land, bringing in of which he was indefatigable—he was an active r trate—like all public-spirited men, he did his part willingly i tical movements and local improvements; and he was emi social, as well as helpful as a neighbour. Deanston House, i like the heart of its master, was large, cheerful, and open both together were as popular socially, as the works and fa operations were interesting scientifically. Those who have h happiness of visiting him there, will not soon forget eith

attractions of the man, or the stirring moral effect of the various interests with which he had surrounded himself. That he could possibly have found time for the minute attention demanded by many of these, was the marvel of all. But, besides his natural activity, he had not only remarkable tact in the selection of assistants, but understood admirably well how to take the full advantage of other men's brains. He was entirely free from that littleness which is often the besetting sin of inventors—an obstinate bias in favour of ideas exclusively their own. On him, on the contrary, no clever hint was ever thrown away, come from whence it might. If from the humblest of his assistants, it was all the more welcome: full merit was allowed, and a hearty meed of praise bestowed on the moment. To be sure there must be no dream of crying "halves" with him afterwards; suggestion and execution were supposed to be equally at his service. But this gracious acceptance of all worthy contributions was neither unpopular nor impolitic. Every one felt himself as if enlisted in forwarding the end his master had in view; and though this was undoubtedly one of the causes which enabled Mr Smith to achieve so much, and in so many ways, yet there is as little doubt that, without his fine directing mind and strong will, such conceptions or embryos as those to which we have alluded would have fallen stillborn and valueless.

But Mr Smith's most valuable achievements were in the field of agriculture; and it is with his admirable system of land drainage —his thorough draining and subsoil-ploughing—that his name will certainly go down to posterity most intimately associated. We have said that in the practice of the first of these he was preceded by his uncle Mr Buchanan. At the time the attention of the uncle and nephew was first directed to this subject, Mr Smith had no farm in his own hand. They had both seen with regret the sums of money that had been expended in deep cross-drains, which only served to carry off the under-water; and often discussed the subject together, as one in which great improvement was called for. Mr Smith had studied the process of furrow-draining with turf, which had been introduced into the carse-lands of Stirlingshire, by Mr Murray of Polmaise, about the year 1806; and perceiving that it was the water which fell on the surface in the shape of rain that these drains carried off, it occurred to him that the same system of drainage, applied to the lands of the up-country, would carry off the surface-water which is so apt to stagnate, especially in cold clay-soils. Mr Buchanan determined to give the plan a fair trial on his estate of Catrine. His own idea was that the drains should be only 18 inches deep; and he made his drains this depth, and at every 12 feet apart, trying the experiment first on a stiff compact clay. This was so successful that he went on on the same plan over the whole estate, which had before been drained with deep drains.

It was in the year 1823 that Mr Smith took into his own hands the farm of Deanston, consisting of about 200 acres; and a better subject for the trial of his powers could not have been found. The land was bad, consisting chiefly of the drifted debris of the old red sandstone—some parts of the subsoil being of hard compact soil with stones, and some in the hollows of sandy clay, composed of the soil which had been washed from the higher parts of the ground. The whole was thickly interspersed with large boulder stones, many of them very near the surface. The active soil was in general very thin, in most places not exceeding four inches. Much of the surface was studded with rushes and other water plants; while the dry knolls were covered with heath, fern, and broom. On this unpromising locality Mr Smith boldly resolved to put the correctness of his well-considered theories fairly to the proof, and to force the desert to blossom like the rose.

Believing a dry condition of the soil to be the foundation of all good husbandry, and that even where there was a subsoil of gravel or sand, (of which there is but little in this country,) the introduction of the thorough-drain system would be beneficial, he determined to carry one uniform mode of drainage over the whole farm. And, first, having found a good bottom-level into which the drains might run, he made his great main drain 4 feet in depth, the receiving drains 3 feet, and the parallel drains—which were placed from 16 to 20 feet apart—2 feet 6 inches deep. There has been much discussion amongst agriculturists in regard to the best depth for parallel drains; and perhaps, before the introduction of the subsoil plough, Mr Buchanan's 18 inches may have been deep enough for some soils. Mr Smith himself says,—"When I first began to cultivate my own farm, although I had put in the drains, I found they were not so efficacious as I had expected, and I then began to think of stirring up the subsoil, which gave rise to the idea of the subsoil-plough." And this was his second and great supplementary improvement, without which the first would have been incomplete, and had, indeed, disappointed his expectations. He thus briefly describes the principle of it:—"There are many subsoils which, though capable of being converted into good soil, yet, if brought up and mixed with the active soil, will so far deteriorate it as to make it for some time sterile. It therefore occurred to me that the great point would be to stir up the subsoil, still retaining the good soil on the surface. Stirring up the subsoil would, in the first place, very much facilitate the escape of the water into the drains; and, secondly, in consequence of the passage of the water through the stirred-up subsoil, and the attendant admission of air, it would be so acted upon as to be converted into good soil; while, at the same time, there was all the advantage of working the good soil as before."

F[illegible] it would be needless in this

Journal, so many pages of which have been already occupied in the discussion of these two important inventions,—on which rest all our great modern agricultural improvements,—to do more now than notice them thus briefly, and in connection with Mr Smith's progress. They were indeed the great steps which placed him in the front rank among the useful men of his day. By means of them the sterile farm of Deanston was in a few years brought into a state of garden culture, the active soil having, by the deep working, been increased from 4 or 5 to 16 inches in depth. And, encouraged by his success at home, Mr Smith's efforts were redoubled in forwarding the work of general improvement. In 1831 he contributed a paper on thorough-draining and deep-working, to the first report by the Messrs Drummond of Stirling of their Agricultural Museum. He spoke clearly and energetically on all proper occasions, public and private, of the advantages of a dry condition of the soil. In 1834 he was examined on these subjects by a Committee of the House of Commons, after which the Chairman of the Committee, Mr Shaw Lefevre, addressed a letter to the Speaker of the House of Commons, in which he referred specially to the system of thorough-draining and subsoil-ploughing detailed to the Committee by Mr Smith of Deanston, as being the only thing likely to promote the improvement of agriculture; and it was chiefly from information gained from Mr Smith's experience, that the late Mr Henry Handley was enabled, in conjunction with Earl Spencer and others, to erect the framework of the Royal Agricultural Society of England, then about to be established.

Agriculturists from all countries now came crowding every year to visit Deanston, and were hospitably welcomed. Besides being entirely thorough-drained and subsoil-ploughed, it was otherwise a remarkable place, having become as pleasing to the eye as it was interesting to the intellect and the heart. The fields were conveniently laid off, kept very clean, and fenced generally with pretty white-thorn hedges; or, where the situation required it, with ornamental belts of thriving plantations, which afforded protection to the crops and shelter to the flocks. Water, for the supply of the fields and for the cattle, was obtained from tanks fed by the drains, and pumped into water-troughs by an ingenious but simple arrangement; and there was not an open ditch on the whole farm. The crops in their season were usually luxuriant, a thorough and uniform dryness having been acquired over the whole surface by the new system of working.

The Factory was no less orderly. It was lighted throughout with gas, which had been introduced there as early as 1813, and before even our large towns had emerged from the grim twilight of tallow and train-oil. The plan of enlargement had been so far completed, the works were thriving, and the machinery by which labour was saved, and work more thoroughly executed, was every

day becoming more and more perfect. In particular, the new movements which Mr Smith had introduced in the carding machines were beautiful and interesting. The power-looms were about 300 in number, and half that number of little girls were competent to conduct the whole working of these. They were arranged in rows, with alleys between them, in a spacious apartment, which in the mornings and evenings of winter was magnificently lighted up with 300 gas-lights. The roof of this building was composed of groined arches, supported on cast-iron columns 12 feet in height; and, the rise of the arches being 6 feet, the greatest height of the ceiling was 18 feet. In the centre of each groin there was a circular opening 8 feet in diameter, surmounted by a handsome glass cupola-light, which in the day-time afforded a uniform and perfect light for the operations carried on below. This building covered upwards of half an acre, and every individual in the apartment could be seen from any point of it. Complete ventilation was everywhere kept up, and the whole of the new works were fire-proof. A covered way was made from the old to the new works, and tunnels formed under-ground, by which communication could be had between the different departments, without going round, or out of doors. Every facility, in short, was afforded to the work-people for carrying on their operations comfortably and pleasantly, as well as perfectly.

The order of management at the works was very much on the principle of that of Arkwright. There was a superintendent to each department; every one had his own allotted part; and in most cases they were paid by the piece, not by weekly wages. On every Thursday morning, that being the market day, they received the amount of their earnings; and the children's wages were paid into their own hands, to give them an idea of personal consequence and responsibility. All had the privilege of leaving the work at any moment they chose, by giving one week's warning; and this was found to insure a more steady, agreeable, and lengthened service than can often be obtained by the firmest indenture. The order of the establishment was preserved by the dismissal of offending individuals, and their banishment for a limited period.

The hands[illegible] village, which had been founded and entirely [illegible] his work-people, was immediately [illegible] contained from a thousand to twelve [illegible] consisted of one long street, parallel [illegible] small houses, two storeys high, with [illegible] conveniently laid out, furnished with [illegible] plentiful supply of water, and had attached [illegible] piece of garden ground, and a range of grass pl[illegible] bleaching. Nothing could exceed the cheerful-

ness and comfort that prevailed everywhere. A schoolroom was united to the establishment, capable of containing two hundred children, and a teacher was paid by the Company. The young children usually went to school at five years of age; and as none were admitted into the factory until they were nine, they were generally pretty good readers, and able to write and cypher a little, before they entered the work. From nine to thirteen they (according to the Factories Act) worked only eight hours a-day, so that three hours more could thus be devoted to the schoolroom. The youth above thirteen years of age were expected to attend an evening school four nights in the week, and there was a Sabbath school for all.

As Deanston thus possessed every facility and recommendation, it is no wonder that the well-disposed order of work-people, all over the country, were eager to gain admittance there. And in his choice among these, Mr Smith showed his usual good judgment and benevolent feeling. In the competition that occurred, there was abundant room for selection; and after a searching inquiry and careful sifting of character, in which he had great tact, he preferred, (among the respectable,) those families to most of the members of which he could give suitable employment. Thus it was no uncommon thing to see a large family — parents, children, young men, and maidens—each of whom was employed in a different department of husbandry or manufacture, and all living happily together under the parental roof, and one general superintendence.

If Deanston, by having become a favourite resort and gratifying spectacle to strangers from all quarters—who came in search of improvements to be carried back to their respective homes—were thus a benefit to more remote countries, it will easily be imagined how substantial a blessing it was found to be to its own neighbourhood. The surrounding landed proprietors, who by degrees came to adopt all Mr Smith's reforms, in drainage, in the better ordering of their farm-steadings, and in an improved system of manuring—to which he had also directed their attention—were well rewarded by seeing their possessions grow rich and fertile, with crops earlier ripened, as well as more luxuriant and of better quality. There was no limit to the honours that were now showered upon him from this class—to the dinners that were given to him, and the speeches that were made in his praise. And all this was gratifying to him; for, like all men of large sympathies, he highly valued the approbation of his fellow creatures. But the enthusiasm of love and respect, with which his genial bearing and valuable services among them had inspired the humbler classes, was still dearer to his heart. By a kindly personal intercourse, he had striven successfully to improve their manners, and to lead them generally to a higher aim than that of mere sensual enjoyment. And his case is an admirable example of how doubly blessed such benevo-

lent exertions will always be; for not only did he, by his tact and good management, promote the comfort and improve the intelligence and good feeling of those under his care, but the sympathy and interest that were in consequence naturally called forth within his own breast secured his happiness, and turned the simplest and most everyday dealings of business into a source of the truest enjoyment.

Many of the inhabitants of Doune, as well as those of Deanston, were in Mr Smith's employment, and were equally the objects of his care and attention. He possessed, in a remarkable degree, a faculty without a considerable share of which no man is ever widely popular—that of individuality. Every man, woman, and child, of both villages, he knew at sight, by name, family, and character; and those who have visited him will recollect with interest the lighted-up faces which constantly marked his appearance at the works — the smiles and curtsies which were showered upon him from cottage doors as he drove past—and, above all, the quick bright glance of recognition and kindly nod with which such greetings were invariably acknowledged and responded to. No "monarch of all he surveyed" was ever, indeed, more thoroughly or more deservedly popular; for none, while conferring the substantial benefits which attend industry, order, and mechanical dexterity, has better understood and practised the kindly arts of lightening the burden of toil to the labourer, by a due interposition of pleasure and amusement, and of softening its pain, by the constant exercise of a humane and generous sympathy.

In turning from the pleasing picture that Mr Smith, in his happy home of Deanston, will ever present to the memory of those who have seen him there, it is with something of the same feeling of lingering and reluctance with which we have in long-past days quitted that hospitable residence, to which his presence for so many years lent most rare attractions. The affectionate simplicity and cordiality of the domestic intercourse, the home-felt ease, which is the right proof of welcome; the subjects of living interest that were ever under consideration, and his clear, straightforward manner of discussing them—of which readiness and natural sagacity, rather than sublety or refinement of view, were the characteristics—the unwearied activity, industry, and energy of the man, with his many hearty, sociable qualities; his cheerful, buoyant spirit and keen relish of existence—all combined to make the very atmosphere [illegible] ful and bracing as it was genial and every [illegible]

[illegible] y, follow his footsteps into [illegible] witness to the triumphs of his [illegible] perseverance; and contemplate him no longer [illegible] of a large circle of loving hearts and [illegible] in the cheerful landscape,

which, though distinguished from all others, is yet so perfectly in keeping with everything surrounding it; but rather as mixing with the crowd in new scenes which knew him not, and beginning life afresh among people no longer his own,—though unweariedly and courageously, yet with *something* of the diminished power and buoyancy that half a century of years will never fail to bring with them.

The exact reasons which induced or compelled Mr Smith to leave this beloved Deanston, though they have never been fully explained, may, we think, be reasonably enough inferred. At a farewell dinner given to him before he left them, he tells his lamenting neighbours, with something like diplomatic vagueness of phraseology, that, "having found it might be conducive to his prosperity and honour, whilst he felt it to be a great duty, he had deemed it proper to leave the beautiful country and delightful scenes in which he had so long mixed;" only adding, as to his future movements, that looking after his interest in certain patents would occupy part of his time, his intention being to devote most of it to his favourite pursuit — the improvement of agriculture. And one of the partners of the firm, on the same occasion, after alluding in the highest terms to Mr Smith's agreeable and useful companionship, professes that his absence will be deeply felt, and trusts that, though changes do take place, there will be none in the friendship which has so long existed between them. There being, therefore, evidently neither accidental quarrel, nor the shadow of a misunderstanding among them to account for the separation, and deeming it impossible that a mere love of change on either side could be the cause, we are inclined to set it down, generally, as one of those painful but necessary occurrences which spring out of the imperfection of all human associations, and for which no one can properly be *blamed*, if looked at from the point of view he has a right to claim for himself. Those who wish for a more definite solution of the difficulty, however, have only to call to mind that the firm had not merely sustained the irreparable loss of its two most enterprising partners, Mr Kirkman Finlay and Mr Archibald Buchanan, but had also had to contend with that severe depression in the trade of the country which began in 1836, and was still undiminished in 1842, when Mr Smith left Deanston; that experimenting, although ever so successfully, is seldom profitable to the experimenter; that Mr Smith's manner of working was dashing and liberal, rather than over cautious and niggardly; and that it must be regarded as quite an exception to the general rule, if mercantile partners ever consider

—— The worth of anything,
More than the money it will bring.

Before leaving Deanston, Mr Smith had established a connexion with several English and Irish proprietors, who had

requested him to examine their lands, and direct them in the improvement of them. The chief scene of the operation of his patents was Manchester; but, as the centre of all interests, he preferred London as a residence, and, in the autumn of 1842, removed there, to a handsome house in Whitehall Place. His family then consisted of his only sister, Mrs Buchanan, and her daughter. Like her mother, Mrs Buchanan had been early left a widow; and, like her also, had found a pleasant home and a right brotherly welcome at Deanston, and had succeeded her mother there as mistress of Mr Smith's hospitable house. The cheerful hospitalities of Deanston were in some measure renewed in Whitehall Place; but Mr Smith's time soon became too fully occupied to permit of his enjoying much of them.

A short time before leaving Deanston, he had addressed a letter to Sir John Gladstone, of Fasque, which was widely circulated, and much considered,—"On the profitable employment and comfortable subsistence of the increasing population of Great Britain." In this he clearly explained the true causes of the depression of trade, then so universal over the country; combated the fear of over-population, which was pressing heavily on many thoughtful minds; and pointed to general improvements in land, (by which he showed that a double amount of produce might be expected,) as the best resource by which an abundance of cheap and wholesome food could easily be supplied to all.

Very soon after his arrival in London, he was appointed one of the Commissioners of Inquiry into the sanitary condition of large towns—a subject well fitted to engage his best energies. For many months he was now constantly engaged, along with his colleagues, in investigating, devising remedies, and making reports. He was quickly impressed with an idea of the great advantage there would be in applying the sewage-water to agricultural purposes, which he thought might be easily accomplished by means of pumping and conveying it to a distance by pipes; and he made an estimate of the expense, to show the practicability of attaining this great object, which would not only be the means of providing funds for the improvement of the sanitary condition of all towns, but would scarcely be less beneficial to the neighbouring agricultural districts. His paper on this subject was published in the Appendix to the *Report of the Health of Towns Commission*; but, as the Government did not take up the question, nothing was at that time effected. His labours on this important subject have not, however, been expended in vain. An impulse was given to the public mind in the right direction, and much careful consideration followed on the best manner of bringing about a reform at once so healthful and economical.

And now that our most patriotic Prince-Consort has so benevolently applied the efforts of his ingenious mind to the construction

of a plan for the more healthful and economical management of the sewerage of London, there is surely no doubt that the question will be satisfactorily settled, and that beneficial alterations will immediately be set on foot in every large town in the kingdom.

Mr Smith's services to Ireland must not be overlooked. Deeply impressed with the advantage that must accrue to that unfortunate country, by any approximation towards the respectable employment of the people, or increase in the natural productions, he set himself energetically to bring about some efficient reforms in the mode of cultivation. He began by giving many practical lectures at the meetings of the Agricultural Society of Ireland, for which he repeatedly received the thanks of that useful association. An interest having, by this means, been created, several patriotic and enterprising Irish proprietors became eager to place themselves under his directions. By his advice, the Deanston system, by which so much had been elsewhere effected, was adopted first by the late Marquis of Downshire, and afterwards by others on whose properties it was found practicable. The desire for land-improving rapidly increased; and it was mainly owing to the new impulse thus given to Irish exertion, and to energetic representations made by Mr Smith on all proper occasions, that the Government was induced to take up the question in good earnest, and to grant that loan to Irish landlords from which so much benefit to Ireland may be rationally expected.

Like all political economists and true lovers of their kind, Mr Smith regarded the railroad as the great invention of the times, and as one of the surest means for promoting the physical comfort and general improvement and intelligence of all classes of the people. But the railway mania, which was at its height in 1844, startled even his sanguine mind, and he invariably refused to enter into the insane speculations that were almost universal among his class. Like all the best practical engineers in the country, however, his time was very fully occupied during these years. His particular walk was the examination and valuation of the land proposed to be employed, in which his natural aptitude and his long agricultural experience had made him the very highest authority.

Among many of those who have been guided by Mr Smith's advice, in agricultural and social affairs, is Mr Matheson, the wealthy and enterprising proprietor of the island of Lews, and part of the summers of 1846 and '47 was spent by Mr Smith in labouring to improve the physical surface of that unpromising locality, and in not very successful endeavours to raise the moral and social condition of its degraded population. It is no uncommon thing there to find whole families lodging quite contentedly in holes dug in the ground; while the better sort generally live in rude mud hovels, roofed with turf, which are only *new roofed* when the old

turf is sufficiently smoked to have become fit for manure. With such a population to work upon, and in a spot so isolated and rude, that everything deserving the name of civilisation was yet to be begun, it is not to be expected that much progress could speedily be made. There was, however, at that time, a lamentable scarcity of provisions in the islands, and Mr Smith had great hopes that the people, starving as they were, might have been induced to exchange such labour as they could give for the very liberal relief in oatmeal and other provisions, provided for the occasion by Mr Matheson. His proposal was, that gratuitous relief should be bestowed on those alone who were unable to work, and that the able-bodied, in order to preserve their independence, should receive wages for their work, and thus be enabled to purchase provisions from the stores provided for them. But this plan, simple and obvious as it may seem, was not found practicable by the subordinates employed. Very large sums of money were expended in relief, and in attempted improvements, but without any appreciable advantage to the spirited and benevolent proprietor, either in the regeneration of the people or the country. After doing all that was in his power, Mr Smith found that his energies were not equal to the task of regenerating the island of Lews. Some useful reforms he did achieve—the work of drainage was begun, and something was attempted in the direction of training the young into better habits; but, on the whole, the progress was in no proportion to the labour, the anxiety, or the expenditure, and all parties were disappointed and discouraged.

Although Mr Smith had not yet nearly reached the threescore years and ten which are said to sum up the life of man, and by reason of his great strength might well have been counted on, as among those who would be spared to the world for some years beyond that brief term, we must already look upon his labours as drawing to a close. He had many interesting works yet in view connected with his favourite pursuit. He had taken a patent for a "dip for sheep," which has been satisfactorily tried by a noble Duke, as well as by some extensive sheep-farmers and breeders, and which bids fair to supersede the dirty and troublesome process of smearing with tar, which has so long been in use. He had extensive plans for improvements in farm-steadings, and for the better housing of cattle, for watering the fields in droughts, and for a convenient distribution by pipes of liquid manure. The latter two of these have already, we believe, been put in operation by Mr Harvie at Port-Dundas distillery, and by Mr Kennedy of Ayr, at his farm of Myrehill, on such a scale as will, in a short time, fully prove the value of the arrangements. One of his last projects was a new application of his ingenious salmon-ladder, nearly in the form of an ordinary turnpike stair, by which a perpendicular fall of upwards of 30 feet on a river in the West Highlands was to be

surmounted and made easily passable for salmon. Whether this and many other of his ingenious but unfinished works may ever be carried out is now doubtful, for the great Destroyer has deprived the world for ever of his active services.

Strong and healthy as he appeared to be, there had been indications more than once in Mr Smith's state of a tendency of blood to the head, which the robust life he habitually led might not improbably have increased. In May last he came to Scotland on agricultural affairs, accompanied by Miss Buchanan, the affectionate niece who had been, since her childish days, the very light of his home; and while on a visit to his cousin, Mr Archibald Buchanan, at Kingencleugh, in Ayrshire, on the 10th of June he retired to bed, after a day of great fatigue and exhaustion, and, though then apparently in good health, expired in the night, without any pain or previous suffering.

In considering the amount of real benefit it has been Mr Smith's privilege to confer on his country, and the success which has attended so many of his inventions, it may be supposed that opportunities could not be wanting, in the course of his prosperous career, by which he might have amassed wealth, in some proportion at least to the great fame he has undoubtedly enjoyed. And that the very reverse is unfortunately the case, is certainly not due either to his having been at any time a speculator in money matters, or at all reckless in his habitual expenditure. Partly, we believe, it is owing to the large portion of his time which was occupied in gratuitous services—in giving those liberal explanations and advices which have set many on the road to riches—but chiefly, it must be confessed, to the sanguine and ardent nature of the man, to the activity of his genius, to the faith he had in himself, and to the almost passionate eagerness with which, sometimes in defiance of caution or a careful calculation of the cost, he would pursue into their very last recesses the results of those new ideas and combinations which his busy brain was incessantly presenting to him.

The poet has truly said that bread is not the reward of virtue. Far less must the power of amassing wealth be accounted as the measure of merit. Mr Smith at least felt that he had something else to do in the world, and that something he has done faithfully, and to the best of his powers. All honour to him!

We have little more to add. Mr Smith was a member of the Established Church of Scotland, and in politics he was a liberal Conservative. He never married. It has been said, with what truth we know not, that in middle life—a time at which, if such a misfortune occurs, it certainly falls the heaviest—he had met with a severe disappointment of the affections. And we can scarcely suppose that, with his warm feelings, he could pass through life without forming some strong individual attachment. But if it were so, no scar of misanthropy, no want of an affectionate interest in those around him, no morbid feelings of any sort, seemed

to indicate that such a blow had ever fallen. If it did so fall, and for a little disturb the waters of his kindly nature, they had closed quietly over it; and no trace was left visible on the surface, except an ever-widening circle of charity and goodwill, which would gladly have embraced the whole human race.

CEYLON.

The island of Ceylon, the cinnamon or spice island, which, on account of its extreme beauty and fertility, and the vast mineral and vegetable riches it contains, has called forth all manner of fine epithets, such as "the pendant jewel of India," "the orient pearl," "the Eden of the eastern wave," and "the gem of the East," is now generally allowed to be capable of becoming, under judicious management and wise and energetic government, the most productive and profitable of all our numerous colonies. The attention of agriculturists has never, we think, been sufficiently drawn to the fact that the soil of Ceylon differs from that of every other part of the globe in this respect, that while all the productions of a tropical climate flourish there in the utmost luxuriance, it is also capable, with ordinary care, of bringing to maturity those of Europe. Cordiner says: "The foundation of the soil is generally a deep layer of reddish clay, mixed with sandy and ferruginous particles. In the country it is called by the name of *cabooc* stone. When first broken up it is as soft as a stiff clay, and as easily cut into pieces; but, after being exposed to the heat of the sun, it becomes indurated and brittle, and is used as stone for the purposes of building. This foundation of the soil is covered with strata of black mould and white sand, the latter of which forms the surface. Its fertility is indeed remarkable, almost everywhere producing grass, shrubs, and trees, of a lively and perpetual verdure." Every one speaks of the extreme beauty and freshness of the verdure of Ceylon, so different from the generally brown and arid appearance of India, from which it is so narrowly divided, and is very generally supposed, indeed, once to have formed a part. The climate is much more temperate than that of India, being continually visited by the most delightful and refreshing sea-breezes; but still, in many parts of the island, a great sense of oppression is experienced from the heated state of the atmosphere. The coolest season of the year is during the south-west monsoon, which sets in in the middle or end of April, and lasts till the end of October, the sun being to the northward of the equator. The north-east monsoon is of shorter duration, prevailing only from November till March, during which the sun is south of the equator. These changes are generally marked by copious and refreshing rains—also by most tremendous thunder and vivid lightning; but there are

fewer fatal accidents from these frightful storms than in more northern countries. This island, being situated so near to the equator, the days and nights are consequently always of nearly equal length, the variations throughout the two seasons not exceeding fifteen minutes. These, indeed, as we have shown, are more regulated by the monsoons than by the sun's course; for, although the island is to the north of the Line, the coolest season is in the summer solstice, during the prevalence of the western monsoon.

On the subject of climate, Bennet wrote, in 1843: "As this important point can only be partially ascertained until cultivation, which scarcely exceeds one-fourth of its superficies, shall have been extended over the whole island, it is but fair to form a criterion for anticipations of the ultimate result by that which has already attended it in places where it has superseded densely wooded and impervious forests, and where the decomposition of vegetable matter has continued through countless ages, and every natural impediment was opposed to evaporation: for there has not been an instance of the continuance of malaria where the underwood has been thoroughly cleared; and even places that are only partially cleared, and where sickness, a few years back, was prevalent and periodical, are become comparatively salubrious. Thus, if a judgment may be formed of the climate of the future whole by that of the one-fourth part of the area of the island now under cultivation, it will be impossible for a healthier to be found in any part of the habitable globe than that to which Ceylon may then justly lay claim." This is rather too highly coloured a picture; but, since Bennet wrote, cultivation has continued steadily to increase, and the results as to health have been highly favourable. In the maritime provinces, the mean temperature is stated at between 79° and 81°; while, in the mountainous regions, and at Newera Ellia, the thermometer sometimes falls below the freezing point; and a friend of ours, who lives about thirty miles from Kandy, 3500 feet above the level of the sea, writes that there is sometimes a change in the temperature of 30° in the same day—the thermometer standing in the morning at 55°, and at mid-day at 85°—which is rather trying to the constitution, long attacks of fever and ague being a frequent consequence. The length of the island is about 270 miles, breadth 100, and circumference nearly 900. Bennet estimates the population, in 1843, at a million and a half; but this must have been a rough calculation, for by the last census it was still under that number.

Before entering into more lengthened details with regard to the island of Ceylon, the present state of its agriculture, and the great staples of its trade, we purpose giving a short account of its ancient history, and how it came at length to be annexed to the British crown.

The Cingalese boast much of the ancient glories of their island,

the early history of which is almost lost in obscurity. The natives, who are much given to tradition, assert that it was from the first king, who conquered and drove out the demons who inhabited the island, that their sovereigns held their title to the land; while the native historians love to tell that, thousands of years before the Christian era, a race of men dwelt there possessed of intellectual powers of the rarest order, and highly cultivated, from whom they have themselves sprung. That this is true, and that the arts and sciences were brought to great perfection by a people who have now been retrograding for ages, is clearly proved by the antiquarian remains of public buildings, the vast temples and tanks that are still to be seen in the island.* The historians also affirm that their isle was the garden of Eden, and that from Adam's Peak, one of the highest mountains in the island, the great progenitor of the human race was thrust forth, and that on the summit of this peak the mark of his footstep may still be traced. There was an island called Taprobane by the ancient classical historians, and numerous proofs have been adduced that this island is synonymous with Ceylon. Dionysius called it "mother of Asia-born elephants, and other strange animals." That the early Greeks had some knowledge of the countries and islands east of the Indus we find from Herodotus and Diodorus Siculus, the latter of whom gives a correct enough account of the size, situation, and productions of the island, and the appearance of its inhabitants—in which, however, a love of the marvellous is too often discernible.

Ribeiro, the Portuguese historian, says "the Chinese, from a remote period, were the masters of Oriental commerce; and some of their vessels were driven upon the coast of Ceylon, near the district which they subsequently termed Chilau. The mariners and passengers saved themselves upon the rocks; and finding the island fertile, soon established themselves upon it. Shortly afterwards, the Malabars, having discovered it, sent hither their exiles, whom they denominated Galas. The exiles were not long in mixing with the Chinese; and from the two names was formed Chingalees, and afterwards Chingalais." The absence of all resemblance between the Chinese and Cingalese, and the strong resemblance of the latter to the Indians, would rather seem to confirm the story that a warlike Indian conquered the island of Ceylon, to which he gave his own name of Singha.† There is a wild race of men called Veddahs still to be found in the interior of the island, living in caves, or wandering from one jungle to another in search of game, and refusing to hold intercourse with the other inhabitants, to whom their language is unintelligible. These are supposed to be the pure aborigines, and that the Cingaese are sprung from the aborigines and the Indians.

* See SIRR's *Ceylon and the Cingalese*, which gives a full and pretty generally correct account of the island, especially as regards its antiquities, superstitions, and religious ceremonies.

† See KNOX's *Historical Relation*.

Pliny, who says that Taprobane was long supposed to be another continent, *alterum orbem terrarum*, and that it was not known to be an island till the time of Alexander, says also that "those who make this voyage cannot conduct their course by the observation of the stars, for the North Pole is no longer visible to the eye. But the mariners, according to an ancient practice, carried birds in the vessel, which they set at liberty at intervals, in order to mark the direction they pursued to the land." The manner in which the Romans first became acquainted with the island of Ceylon is thus recounted by Philalethes:—"An accidental occurrence, in the reign of the Emperor Claudius, contributed to make the Romans more acquainted with the island of Ceylon, and to increase their intercourse with that part of the world. One Annius Plocamus, a freedman, who farmed the customs in the Red Sea, having been blown in a violent tempest off the coast of Arabia, was unexpectedly driven, after a passage of fifteen days, to the port of Hippuros, in the island of Taprobane. Here he was kindly received by the king of the country, whose hospitality he experienced during a period of six months. In this interval, this European visitant had ample leisure to make the Ceylonese monarch fully acquainted with the majesty of Rome. He accordingly despatched an embassy, consisting of four persons, to the imperial city." The same author represents these ambassadors as giving a most erroneous account of the island—that it contained five hundred towns, and an immense population, who traded with the Seres, (supposed to be the Chinese,) and describing them as of gigantic size, having red hair, blue eyes, shrill voices, and speaking an unknown tongue, the traffic with whom was carried on as it had been between the Britons and the Phœnicians, each party placing the goods they wished to exchange in a certain place, and not relinquishing them till they had received a full equivalent.

These ambassadors also stated the wealth of the inhabitants to be greater than that of the Romans, although they did not turn it to so good account; and Pliny says, that "though Taprobane is so far removed from the Roman world, still it is not free from the vices of Rome. Gold and silver are there objects of cupidity. They have variegated marble, jewels and pearls, which are of great beauty, and in high esteem." According to Pliny, also, the government of the island was more free than it has long since been, showing a greater degree of civil liberty, and regard for popular rights, and principles more adverse to the abuse of sovereign power, than perhaps ever existed in any of the regions of the East. Their king was chosen from amongst those who were most reputed for their humanity, venerable in years, and without family. In case the kingdom should become hereditary, they compelled him to resign the sovereignty, if he should happen to have children. A council of thirty persons were appointed to

him by the people, and no one could be sentenced to death but by a majority of these. An appeal from their judgment could afterwards be made to the people, who then appointed seventy other judges to try the cause; and if they reversed the sentence by which the accused had been condemned, disgrace followed to the former thirty, who were never after this held in estimation. If the king himself violated his duty to the people, their universal detestation was his immediate punishment, though they offered him no violence. Elephant and tiger hunting was what they chiefly delighted in; their fields were highly cultivated, and slavery was unknown. There were no grapes, but abundance of apples in the island; and it is remarkable, that in none of the ancient accounts of Ceylon is any mention made of cinnamon, for which it is now so celebrated; but it is said to have supplied the Indian market with ivory, tortoise-shell, and other commodities. Macpherson, in his Annals of Commerce, supposes that cinnamon, instead of being the aboriginal growth of Ceylon, had been afterwards naturalised there, as cloves were in Amboyna. Diodorus Siculus, in his strange and fabulous account of the island, describes the inhabitants living to an extreme old age, and scarcely subject to disease at all. He says "they have a severe law, according to which they put to death those who are mutilated or labour under corporeal deformity; but what is more remarkable, a law to limit the duration of life; and that those who had attained this period, took their leave of existence by a voluntary but uncommon death. The country produced a plant on which he who fell asleep expired without a struggle or a sigh."

That a regular system of commerce was maintained between Southern Europe and India, and Ceylon, as far back as the first century of the Christian era, all writers agree; and when we come down to the sixth century, we find that Ceylon had become the chief seat of the commerce of the Indian Ocean. Macpherson, in his valuable work formerly quoted from, says "vessels entered its ports from the most remote parts of the East; and the merchants of Ceylon, in their turn, were not deficient in commercial enterprise. From China, called Tzinitza, they received silk, aloes, cloves, the wood of cloves, sandal wood, and other articles; from Male (Malabar) they imported pepper; from Calliena, now a place of great trade, copper, wood of sesame like ebony, and a variety of stuffs; and from Sindu musk, castoreum, and spikenard. All these articles, together with some spiceries, and the hyacinths, for which the island was famous, were exported to every shore of the Indian ocean. The Persian traders to Sielediv (Ceylon) appear to have been very numerous, since there was a church erected for them, the clergy of which received ordination in Persia. A principal part of their cargoes consisted of Persian horses for the use of the king."

We have no further account of this island till the thirteenth

century, when, after the strange and universal torpor of ages, men's minds began gradually to awaken, and a fresh spirit of enterprise and cupidity was again everywhere manifested. Marco Polo, a Venetian, justly called the Columbus of the East, seeing he was the first European who penetrated as far as the sea beyond China, or at least made mention of it, visited Ceylon on his return from his far-famed travels, about the end of that century. The greater part of his long period of absence, which extended from the year 1271 to 1295, he spent at the court of the great Khan of Tartary, on the borders of China. Although only nineteen years of age on his arrival there, he quickly rose so high in the confidence of the Khan that he sent him on important missions to distant provinces of his vast empire; and in passing through the different countries, Marco diligently made use of such a favourable opportunity to become acquainted with their customs, manners, and produce. He traversed nearly the whole kingdom of China, which he describes under the name of Cathay, visited different parts of Indostan, and makes mention of Bengal and Guzzerat as great and opulent kingdoms. Besides his discoveries by land, he made more than one voyage into the Indian Ocean, visited the island of Japan, which he calls Zipangri or Cipango, Java, Sumatra, and other islands near them, as well as the island of Ceylon, and the coast of Malabar as far as the Gulf of Cambay, giving to the people of Europe the most complete descriptions of the countries of the East, of which they had formerly no other knowledge but from the geography of Ptolemy—so that not only his own countrymen, but all the nations of Europe, stood amazed at the discovery of so many countries lying beyond what they had hitherto regarded as the utmost boundary of the earth. Marco Polo says of Ceylon: "It is the finest island in the world; the king is called Sendernaz; the men and women are idolators, go naked, save that they cover their loins with a cloth; have no corn, but rice and oil of Sesamino, milk, flesh, wine of trees, abundance of brasil, the best rubies in the world, sapphires and amethysts, and other gems. The king is said to have the very finest ruby that was ever seen, as long as one's hand and as big as a man's arm, without spot, shining like a fire, and not to be bought for money!" In another part he says—"In this island there is a very high mountain, so rocky and precipitous that the ascent to the top is impracticable, as it is said, excepting by the assistance of iron chains employed for that purpose. By means of these, some persons attain the summit, where the tomb of Adam, our first parent, is reported to be found."

Contemporary writers, as well as those who wrote long subsequently to the death of Marco Polo, treated his account, which bore strong internal evidence of its veracity, as partly exaggeration and partly fable; but the observation and research of future travellers have entirely vindicated his memory from such an accusation. The accomplished and candid historian Tiraboschi, in his *Storia*

della Letteratura Italiana, says that the faults and seeming inconsistencies in the works of Marco are to be ascribed to those who wrote his manuscripts, which all vary more or less. It was even matter of dispute whether the original had been written in Italian or Latin; but Tiraboschi completely settled the question, by proving that it had been composed in the current Venetian dialect of the day. Marco Polo has ever since been regarded as an undoubted authority.

Half a century after the death of Marco Polo, a countryman of our own, a native of St Alban's, called Sir John Maundevile, visited Ceylon, and wrote an account of it in a work which was not published till 1588. It is entitled "The Voyage and Travaile of Sir John Maundevile, Knight, which treateth of the way to Hierusalem and Marvayles of Inde," &c., and shows better information than all former travellers as to the dimensions of the island—his statements, indeed, being very near the truth. He speaks, among other things, of a vast wilderness contained in the interior, infested by wild beasts, serpents, and crocodiles—also by a tribe of gigantic elephants. He notices the appointment of the king by election, and says that the island had two summers, two winters, and two harvests in a year. He mentions Adam's Peak as the mountain where Adam and Eve wept for a hundred years, after having been driven forth from Paradise, till they filled a lake with the effusions of their remorse.

Another Venetian, of the name of Nicola de Conte, gives in the year 1444 an account of the size of the talipot tree with its mighty leaves, as well as of the gems and pearls of Ceylon, and the method of preparing the cinnamon. From this period to the sixteenth century we have much interesting and valuable information, both as to the trade of the island and the general condition of its inhabitants; but we pass on to the year 1505, when Lorenzo d'Almeyda, son of the Viceroy of Goa, who had been sent with a fleet of nine sail to pursue some vessels with Moorish pirates which were passing by the Maldives, was driven by contrary winds to the coast of Ceylon, of which he thus accidentally made the discovery. He found the most violent dissensions and sanguinary feuds prevailing in the country, which was divided into several kingdoms, whose sovereigns were dependent on the will of an emperor. It is said that, in ancient times, there were no fewer than sixteen kings in Ceylon, who met once a-year to celebrate a grand festival which lasted sixteen days, thus allowing a day and night of rejoicing to each. The oldest of these kings was frequently chosen emperor; but this custom fell at length into disuse, and the emperor found means to perpetuate his power, and to make the yearly meeting a virtual acknowledgment of subjection to a lord-paramount. These native rulers were in a constant ferment of warfare, now with the Malabars, and now with the Moormen of the neighbouring continent, making treaties of peace and breaking them on the slightest

pretence, till Kandy and the surrounding country was in the end subjugated by the Malabars, who placed one of their own princes on the throne. The Kandian kings, successors of this prince, maintained their conquest and authority, not only against the native kings of the south, but against the Portuguese and the Dutch, until dethroned by the British in 1815. In spite of these perpetual dissensions, the people seem to have been possessed of great wealth, and to have brought the arts and sciences to a high state of cultivation, as attested by the historical writings, as well as by the ruins of ancient magnificence, to be seen everywhere throughout the island.

The father of Lorenzo, Francisco, viceroy of Goa on the Malabar coast—the principal settlement of the Portuguese in the East—was noted as a crafty and active politician, peculiarly fitted to carry on the designs and increase the conquests of his sovereign. Lorenzo, accordingly, who first cast anchor in the bay of Galle, and to whom an ambassador was sent in the name of the emperor, immediately entered into an amicable treaty with him, to the effect that the Cingalese monarch should pay an annual tribute of two hundred and fifty thousand pounds of cinnamon to Emanuel, King of Portugal, who agreed in return to defend the emperor against his enemies; and, as a sort of ratification of the treaty or sign of subjection, Don Lorenzo caused to be erected on the spot a marble pillar engraven with the arms of Portugal. The Portuguese historian Ribeiro writes, that when Alvarengo was sent by his king, in 1518, with a fleet of nineteen sail to enforce payment of the tribute, he found a considerable trade carried on in the island, for in its harbours vessels from the Red Sea, from Bengal, and from Persia, were to be seen, "waiting for their freights of elephant's tusks and spices." Alvarengo immediately proceeded to erect a fort, alleging the permission of the emperor; but having been impeded in the work by the Cingalese, he attacked them with such vigour that they were forced to make peace, on condition that the Portuguese were to be permitted to erect a fort at Colombo, and, in addition to the former tribute paid to King Emanuel, six elephants and a great number of precious stones annually. The first fort erected by the Portuguese, at Colombo, was composed of a mixture of clay and stone; but in 1520 they raised stronger and more regular fortifications. They then revived former animosities by becoming insolent in their strength, and committing acts of violence on the Cingalese, who vigorously retaliated; and constant hostilities were the consequence. These were carried on with more or less bitterness—the Portuguese always coming off victorious in the end, although they were once besieged by the Cingalese in their fortress of Colombo for the space of five months, and would have perished had they not received succour from China—down to the year 1580, when the whole island was ceded to the crown of Portugal by the native monarch, whom the Portuguese themselves had raised to the throne.

More than fifty years before this event, the Roman Catholic worship had been introduced into Ceylon by the Portuguese, who endowed a monastery in Colombo. The son of a native chief, called Fimala Lamantia, had been also sent by them to Goa to be instructed in the Roman Catholic religion; and he was baptised there by the name of Don John, after Don John of Austria, brother of Philip the Second, King of Spain and Portugal. What influence this Don John, who afterwards made a considerable figure in Cingalese history, may have exercised in the dissemination of the Christian religion, we are not informed; but after the cession of the island to the crown of Portugal in 1580, we learn that many of the low caste women began to live with the Portuguese and to turn Christians, "for the sake of Portuguese gold."* From the intercourse of these women with the Dutch and Portuguese settlers, have sprung the half-castes, or Ceylonese, as they are called to distinguish them from the Cingalese. The people of this race are also known by the appellation of *burghers*.

The Portuguese now made an attempt to subjugate Kandy, which had hitherto continued to be an independent state, and sent thither an immense force with that intent; but they were repulsed and defeated with great loss. Neither were they suffered to retain quiet possession of the island, for Rajah Singha, one of the native monarchs, proclaimed himself King of Ceylon, which was the cause of a long and bloody war, only ending with the death of the usurper, which took place in the year 1592. This Rajah Singha, although a perfect monster of iniquity, and guilty of the most horrid cruelties, had yet considerable taste for literature, and extended his patronage to men of genius. On his death, at the advanced age of one hundred and twenty, he was so smitten with a sense of the monstrous cruelties he had committed, that he sent for the priests and asked them if such an one as he could hope for pardon. With more honesty than the ghostly counsellors of dying kings are wont to exercise, they replied that he could not hope to be forgiven; upon which he was so enraged at their presumption, or want of loyalty, as he called it, that he ordered them all, except the chief priest, to be confined and burnt alive. He then sent for others, who, warned by the fate of their brethren, and fain to answer him in a more soothing manner, said that if his Majesty felt true contrition for his sins, they would, by means of their prayers, secure to him an intermediate abode between heaven and earth, instead of being tormented like the wicked by demons. The guilty conscience of the dying king thus composed, he would have loaded the priests with presents, which they however declined receiving. He then begged them not to think of the massacre of their brethren, which he had ordered in a paroxysm of rage. They gave him the desired assurance, on receiving which

* This is recounted by one of the native historians.

he gave up the ghost.* Don John, formerly mentioned, who had long been noted for his ambition and turbulence, and had once indeed prevailed on the people of Kandy to elect him as their emperor, no sooner heard of the death of Rajah Singha, than he began to concert measures to render himself master of the whole island, and mustered an army of thirty or forty thousand men; but the Portuguese marched against him, and attacked him with so much fury that he was completely routed, and forced, together with his queen, to take refuge in a wood, and to subsist as they best could on the wild roots and plants they could gather there. He afterwards, however, rallied his strength, took possession of nearly all the Portuguese fortresses, became paramount in the island, forced his Portuguese prisoners to work as slaves in the erection of bulwarks and fortresses, and reduced his enemies to a state of extreme weakness, from which they were not relieved till three years afterwards, by the arrival of reinforcements from Goa.

We shall now pass on to the year 1602, when the Dutch, who already had large and valuable possessions in the East Indies, first began to think of Ceylon as a new field for gain and enterprise, in pursuance of which they by degrees supplanted, and at length expelled, the Portuguese. Having anchored on its shores in March of that year, in the July following their admiral, Spillbergen, entered into amicable relations with the King of Kandy, who permitted him to build a fort on the shore, and to carry on a trade in some of the spices of the island. He soon, however, began his aggressive movements against the Portuguese, and the next fifty-four years presents the history of constant warfare between them and the Dutch—the latter assisted by the Kandians—during which we have razing of forts, massacres, treacheries, and all the usual horrors of war, interrupted only by one truce of any consequence, and which lasted for nearly ten years. In 1655 the Portuguese governor of Jaffnapatam was captured by the Dutch near Colombo, to which place they laid vigorous siege both by sea and land; and after an obstinate resistance of seven months, during which the garrison was reduced to the most frightful extremities,† it surrendered on condition that the Portuguese should be suffered to retain quiet possession of Jaffnapatam, now their only remaining stronghold in the island. The Dutch soon followed them thither, however, taking the garrison after a siege of four months, making its inhabitants prisoners of war, and exercising the most barbarous cruelties.‡

Thus ended the dominion of the Portuguese in Ceylon. On their first arrival in India, by the superiority of their naval tactics, they wrested the trade from the hands of the Saracens and Arabians, and by violent means took possession of large tracts of

* See Valentyn the Dutch historian.

† See Ribeiro. ‡ Ibid.

land. To increase and confirm their dominion, they contracted marriages with the native women, and set about establishing the Roman Catholic faith; but their towns and fortresses being confined to the coast, and remote from each other, they were consequently exposed to the attacks of the native chiefs, and the towns they inhabited were filled with a motley assemblage of slaves, half-converted natives and wandering Moors, ill fitted for the purposes of defence. The pride of the Portuguese, and the indolent habits which it produced, contributed also to accelerate their fall. All manual labour which required either strength or skill, was reputed a degradation to a Portuguese. Thus the handicraft trades and useful employments were consigned to slaves. They taught the Indians to do everything that they wanted to be done, and even to act as sailors on board their ships. A Portuguese was thought to be dishonoured by any but a military employment.* The Portuguese, thus ostensibly warriors, and chiefly occupied with conquest and defence, had not directed their energies, as they might have done, to the cultivation of the soil, but had wearied the inhabitants by their avarice and their oppressions. Percival says—"The joy of the Ceylonese on being delivered from the yoke of these tyrannical invaders, and their gratitude to their deliverers, at first knew no bounds. The King of Kandy willingly paid the expenses of their armaments in cinnamon, and conferred upon his new allies the principal possessions from which he had, by their assistance, expelled the Portuguese." "The Dutch appeared exceedingly grateful to the monarch for all these concessions, and assumed only the humble appellation of *guardians of his coasts*."

We come now to Knox's "Historical Relation of the Island, with an account of his captivity during a period of near twenty years," universally allowed to be trustworthy in the highest degree, and in which he treats of its inhabitants, customs, produce, laws, and of the strangely tyrannical government of the king he found reigning there. Of the inhabitants he says—"Besides the Dutch, who possess, as I judge, about one-fourth of the island, there are Malabars, that are free denizens, and pay duty to the king for the land they enjoy, as the king's natural subjects do: there are also Moors, who are like strangers, and hold no land, but live by carrying goods to the seaports, which are now in the Hollanders' hands. The seaports are inhabited by a mixed people, Malabars and Moors, and some that are black, who profess themselves Roman Catholics, and wear crosses and use beads; some of these are under the Hollanders, and pay toll and tribute to them." Knox, with his father, Captain Robert Knox, after trading from port to port on the coast of Coromandel, were on their return to England, when "there happened such a mighty storm, that in it

* See Philalethes' History of Ceylon.

several ships were cast away," and theirs being so disabled that she could not proceed, they put in to Cotair Bay, in the island of Ceylon, and were there taken prisoners, with others of the ship—sixteen persons in all. In his valuable and interesting *Relation*, he gives a most touching account of the sickness and death of his father, soon after being taken into captivity: how he was "always sighing and groaning in a most piteous manner, which for me to hear and see coming from my dear father, myself also in the same condition, did almost break my heart. But then I felt that doctrine most true which I had read out of Mr Rogers's book, that God is most sweet when the world is most bitter." He then tells that his father "was consumed to an anatomy, having nothing left but skin to cover his bones; yet he often would say that the very sound of liberty would so revive him that it would put strength into his limbs. But it was not the will of Him to whom we say, Thy will be done, to have it so." The night before his death "he told me that he sensibly felt his life departing from him, and was assured that this night God would deliver him out of this captivity, and that he never in all his lifetime thought that death could be so easy and welcome to any man, as God had made it to be to him; and the joys he now felt in himself, he wanted utterance to express to me."

We have then an account of the admirable charges he gave his son; after which, "about two or three in the morning, he gave up the ghost, being very sensible unto the very instant of his departure." After giving an account of his burial, the son says—"Thus was I left desolate, sick, and in captivity, having no earthly comforter, none but only Him who looks down from heaven to hear the groaning of the prisoners, and to show himself a father of the fatherless, and a present help to them that have no helper." His own ague increased to such a degree that he could scarce hold up his head. "Often have I prayed, as Elijah under the juniper tree, that God would take away my life—for it was a burthen to me." He then tells how he was "struck into a great passion at the sight of a Bible, which so rejoiced me and affrighted me together, that I cannot say which passion was greater—the joy for that I had got sight of a Bible, or the fear that I had not enough to buy it." But we have dwelt too long, we fear, on this delightful work, to which we must refer the reader who would wish to hear more of the author's struggles and final escape from the island. There is much chastened and subdued energy, as well as a spirit of the most enlightened piety throughout; and a grace and dignity of style which strongly reminds us of the exquisite *Memoirs of Mrs Lucy Hutchinson*, and which, even after making allowance for the charm of quaintness, we look for in vain in the writings of the present day.

If the Portuguese were more warriors than merchants, it may, with as great truth, be said of the Dutch, that they were more

merchants than warriors; and, consequently, the history of their rule in Ceylon is the less interesting. The crafty Hollanders soon recovered from their fit of humility and gratitude to the native monarch, against whom they were not long of rebelling. Percival says—"The renewed oppressions of the Dutch was the constant signal for the renewal of hostilities between them and the natives. A long course of warfare rendered the Ceylonese both brave and dexterous. The Dutch were frequently repulsed even in close combat; several of their forts were taken; and whenever they attempted to penetrate into the interior parts of the island, they seldom failed to lose large parties of their men in attempting to force the woods and defiles, or by the ambushes with which their vigilant and active enemy everywhere surrounded them. But European discipline and Dutch perseverance frequently surmounted all these difficulties."

In 1672 the French attempted to form a settlement in Ceylon, and, appearing off the island with a fleet of fourteen sail, entered into a treaty with the king, with the view of driving out the Dutch. But the folly and vanity of their ambassador, De Lancrolle, who thought it derogatory to the dignity of his nation that he should observe the ceremonial of the king's court, caused first his own imprisonment, and then, in the end, the total overthrow of the only great attempt made by the French upon the island.

It was in the year 1766 that the British appear, for the first time, to have turned their attention towards Ceylon, and to have sent thither a mission with the view of conquering it. By their vigour and enterprise they had already attained considerable ascendency in India, and were pursuing their conquests on the Coromandel coast. But it was not until the opening of the year 1782, that a fleet commanded by Sir Edward Hughes, with a detachment of land forces under that of Sir Hector Munro, was despatched by Lord Macartney, then Governor of Madras, with orders to seize on the Ceylonese possessions of the Dutch, with whom we were then carrying on war. The fort of Trincomalee was taken by the British the very morning after their arrival, and Mr Hugh Boyd sent as ambassador to the Kandian court. But he found it impossible to remove the impressions made on the mind of the king by the perfidy and bad faith of the Portuguese and Dutch, which had naturally shaken his faith in all Europeans. The ambassador appealed to the well-known integrity of the British; but all in vain: he found it impossible to persuade the king to conclude a treaty. Knighton, alluding to the account left by Mr Boyd himself of this embassy, says: "Such was the inaccessible nature of the country, that, although travelling with all the speed circumstances would allow, he did not reach Kandy—distant one hundred and seventy-two miles from Trincomalee by the route which he took—till the 4th of March, having left the latter fort on the 5th of February. The country in that direction was, as it

still is,* in a wretched condition. Occasionally a tolerable pathway was to be met with, but generally they had to force their way through an almost impervious forest, inaccessible even to the light of heaven. Scenes of the richest and most sublime character were not wanting, however, to diversify the journey; but everywhere a lamentable deficiency of inhabitants exemplified the almost ruined state of the country."

At length, in 1795, Holland having formed a union with the French republic, war was declared against the former by the English, and the Government of Madras sent General Stuart, at the head of a considerable force, to reduce the island of Ceylon. The only resistance made by the Dutch was at Trincomalee, which they had re-taken, and which was not surrendered to the English till it had sustained a siege of three weeks. Jaffna and Negombo having surrendered at the first summons, the general next turned his attention to Colombo, expecting a lengthened siege; but what was his astonishment to find that the Dutch had thrown the guns of the battery into the river, and evacuated the fort, and that they were only to be opposed by a party of Malays, under the command of Colonel Raymond, a Frenchman, who were soon put to flight; and, in a few days, the capital of the maritime provinces surrendered, as well as all the other forts in the island. The English would not have found the island so easy a conquest but for the state of degeneracy into which the Dutch had fallen. They had themselves been vigorously opposed by the Portuguese, whose forces were in a reduced condition; but then they were united and well disciplined, whereas the Dutch had now fallen into a state of turbulence and disorganisation. The evacuation of Colombo was not caused by want of numbers, for these were fully equal to that of the enemy. Percival thus explains it: "The dissensions among both the civil and military officers of the garrison was a cause which more powerfully hastened its surrender. Those principles which have produced so many convulsions and atrocities in Europe, had also penetrated into this colony."—"The state of discipline in the garrison had also fallen into the most shameful disorder. Drunkenness and mutiny were carried to the greatest height. The old governor has frequently declared, at the tables of our officers, that he was in constant danger of his life from their mutinous conduct. He had resolved to defend the place to the last, but, such was the state of insubordination which prevailed, that he could not by any means induce the Dutch troops, and in particular the officers, to march out against the enemy." We have no reason, therefore, to plume ourselves on this conquest—at least as regards the difficulty of achieving it.

It was in the year 1798 that the Honourable Frederick North, afterwards Earl of Guilford, was made governor of Ceylon, which

* In 1845.

was then declared to be a king's colony,—a native prince, however, being still permitted to occupy the throne of Kandy. Amidst the engrossing cares of a new colony, the governor found leisure to ameliorate the condition of the people, and to introduce many improvements, of which we shall treat hereafter. Much vigilance was required on the part of the governor to elude the arts of Pilimi Talawe, the first adikar or prime minister at the Kandian court. The infringement of a treaty which had been entered into in the year 1802, and which permitted free commercial intercourse to the subjects of both powers, had been violated by the Kandians, who plundered some Mahommedan merchants, who were British subjects, of a quantity of areka nuts, and for which the governor demanded restitution. This having been promised, but not furfilled, war was declared in 1803, and a considerable force marched into Kandy. The king was dethroned, and another set up in his place; but the turbulent prime minister kept up a constant system of harassing petty warfare, and at last prevailed on General Macdowall, the commander of our troops, to confer on him the supreme power in Kandy, and to suffer the king they had raised to retire with a pension. The General was then unfortunately compelled to leave Kandy, on account of illness, and he left the garrison under the command of Major Davie, who, on being besieged by the treacherous Talawe, evacuated the fort, barbarously leaving one hundred and twenty—some say one hundred and fifty—sick and wounded Europeans in the hospital, without making provision for them in the articles of capitulation, all of whom were massacred, as well as great numbers of our troops. He afterwards, no less barbarously, delivered up the fallen king into the hands of his enemies.

In 1805, Governor North returned to England, carrying with him the goodwill of the natives, as well as of the British subjects, and was succeeded in his office by Sir Thomas Maitland. Several attacks had been made on the British by the Kandians under their former king, now become a perfect monster of iniquity and cruelty, but in this year there was a cessation of hostilities, and peace continued until 1814. In the interval we have the most frightful accounts of the tortures, mutilations, and massacres perpetrated by this tyrant, including the putting to death the wife and five children of one of his ministers. Numerous complaints having been made to Sir Robert Brownrigg, then governor of the island, he, in 1815, declared war "against that tyrannical power, which had provoked, by aggravated outrages and indignities, the just resentment of the British nation,—which had cut off the most noble families in the kingdom, deluged the land with the blood of its subjects, and, by the violation of every religious and moral law, had become an object of abhorrence to mankind." The governor marched in person against the tyrant, and, four days after having established his headquarters at Kandy, from which the king had

made his escape, he was discovered, and captured by the British. He was nobly defended by his Malabar escort, and would have escaped much longer, had not his own subjects aided the British in their search. The king was banished to Madras, and afterwards removed to Vellore, where he died.* A treaty of peace was then drawn up, both in English and Cingalese, and unanimously assented to. The British flag was hoisted, and a royal salute fired. Thus was extinguished the independence of the Cingalese, —an independence which had lasted, almost without interruption, for two thousand three hundred and fifty-seven years.

COGITATIONS ON WHAT IS THE FIELD DRAIN.

By Mr William Burness, London.

A drain, says one, ought to be 48 inches deep; 42 inches says another; only 30 inches, adds a third; while the diameter of the pipe tile should be 1, $1\frac{1}{2}$, and 2 inches, say they respectively; because, says the first, a drain 48 inches deep must discharge more water than one only 30 inches.

To look for anything like perfection in the art of draining, when differences such as these exist, would, we think, be a hopeless undertaking; and how to account for them, in an age like the present, is certainly no easy task—a drain, one is almost led to conclude, must be a mysterious and incomprehensible something. In the old school, when phenomena in nature could not be satisfactorily accounted for, they were briefly disposed of as belonging to the "*occult*" class; but in modern times we have no such classification—science has got a stage beyond this resting-place. We now live, it may be said, under the auspicious sovereignty of science and practice. Unless substantiated by experiment, philosophy deigns not to pass current her propositions to the world.

Experiment, however, is not on all occasions the just tribunal. All that experiment proved, up to the period of Torricelli, was, that "nature abhorred a vacuum;" and even after experiment had overturned this doctrine, the only progress made was, that nature abhors a vacuum only to a certain height, thirty-three feet, and no further.

Although such were the current dogmas of the old school, yet they were not considered philosophical by every mind. Experiments were still demanded to set at rest the question; and so is it in the case of draining—experiments are still wanting, to settle divisions, and these, if properly performed, we are afraid will not justify the deductions of either party.

---

* For particulars regarding the downfal of the tyrant, the strange levity of his conduct after his capture, and the complete triumph of the British, see an interesting and unpretending little work, called *A Narrative of Events which have recently occurred in the Island of Ceylon, written by a Gentleman on the spot.*

But although experiments are still wanting to enable us to establish the theory of draining on a solid foundation, or conjoined with practice, yet, from the number of satisfactory experiments made, connected with the science of hydraulics, and handed down to us by Torricelli and others, we think farther progress should have been made than we have yet attained. We should not have been disputing the fact as to whether a drain 48 inches deep would discharge more water than one only 30 inches. Questions of this kind, we think, might be satisfactorily disposed of without further experimenting on the subject. Let us take an example, from a different branch of hydraulics, to illustrate the case, and division will appear impossible. Let us take, for instance, the parson's pump, say 3 inches in diameter, and the pump of any of the Metropolitan Water Companies—say probably ten times this diameter—and who will then say that the parson's pump will discharge more water than its metropolitan opponent? We take upon us to say—not practical farmers, let amateurs say what they may. Who, therefore, says that the drain 30 inches deep will discharge more water than its opponent of greater capacity—viz., 48 inches in depth? Many a practical farmer! What? Yes, many a practical farmer; and, in presuming thus far, they are not without ample support in every province of the kingdom. Impossible! Where is the party, we repeat, who will venture so far as to say that a tube, 3 inches in diameter, will discharge more water than one of 30 inches?

The anomalous position in which we have now placed parties, requires a little explanation. In draining, *we express one thing and mean another. Popular phraseology is here at fault.* We say, the diameter of the parson's pump, but the depth of the farmer's drain. *What is the difference?* Is the expression, diameter, too learned and mathematical for farmers? By no means! To suppose so were an insult. In proof of the contrary, we say the diameter of a pipe. How, then, do we settle the difference? All the world knows that "the depth of the parson's pump" is its length. Are we from thence to conclude, by analogy, that the depth of the farmer's drain is its length? Let us not commit ourselves on a point of so much importance, but understand each other properly. To do so, let us suppose the three parties, A, B, and C, and that they are disposed to run a race—a contest which has reference to length only. A proposes to run 48 yards before B and C run 42 and 30 yards respectively. If this is the proper position of parties, how are they prepared to maintain their respective grounds? Is B prepared to beat his opponent C? At Epsom or Doncaster it is perfectly possible. Start when they may, until the race is run, a thousand bets will assuredly be made. It would be useless to attempt to prove the contrary by mathematical demonstration. The mathematics have nothing to do with the subject. A will beat C, and C will beat A, are problems which can only be solved

at Epsom or Doncaster. We must therefore allow the theorems of Torricelli, Venturi, Sir Isaac Newton, and others to repose a little longer on the shelf. Doubtless on Epsom race-ground, as on that of Doncaster, the experiments of those eminent philosophers, however much the world may be indebted to them in other respects, go for nothing. There may, however, be a slight difference between the race-ground and the field of the drainer, according to our present statement, which may therefore alter the relative position of parties. At Epsom and Doncaster, three parties run for the prize—viz. A, B, and C; but, in the field of the farmer, only one, *water*, starts for the prize. Now, when Flying Childers starts against Eclipse, there may be a thousand odds against either; but when Flying Childers starts alone, Epsom and Doncaster are undivided on the subject. Parties are unanimous that he will gain the cup. It were downright madness to bet against it. To bet that Flying Childers would run 48 yards before he ran 30 yards, would entitle the better to the interior of Bedlam, on every race-ground in England. In Scotland, we have certainly heard of Wallace's sword cutting before the point, and in Ireland, of Paddy's gun killing round the corner; but in neither did we ever see the attempt made to prove, by experiment, that Flying Childers could run 48 yards before he had run 30 yards, *or that water would flow* 48 *inches before it had flowed* 30 *inches.* Were we to publish such dogmas to the world as these, where is the party who would believe them, even although backed by a thousand experiments? Any attempt of this kind would be neither less nor more than an attempt to lay it down as part of our philosophy in draining, *that the greater is less than the least!*—a proposition too gross to have been credited, even in the age of skin-clad Druidism. Such being the case, how do parties differ? Are we agreed upon the point, that the depth of the farmer's drain is its length? This is a matter-of-fact question, so to speak, which doubtless can easily be solved. Either it is, or it is not. Doubtless, if it is not the length of the drain, or part of the length, it may perchance be the diameter, semi-diameter, or some part of the diameter of "the pipe." What says science on the subject? or rather let us hear, in the first place, the answer of practice, or of the parties, A, B, and C, themselves—what they mean by a drain 48, 42, or 30 inches deep. Says A, I open a cut 48 inches deep, the length of my field. In the bottom of this cut I place a row of pipes, and then fill in the excavated earth over them, and this I call a drain 48 inches deep; B and C give similar answers, substituting 42 and 30 inches respectively, for the 48 of their opponent A. Here parties are agreed. In this department of practice, therefore, we have no jarring differences to settle; wherefore, a drain 48, 42, or 30 inches deep, is a pipe with a depth of 48, 42, or 30 inches of earth over it, or on its back, so to speak. The question now therefore resolves itself into this—

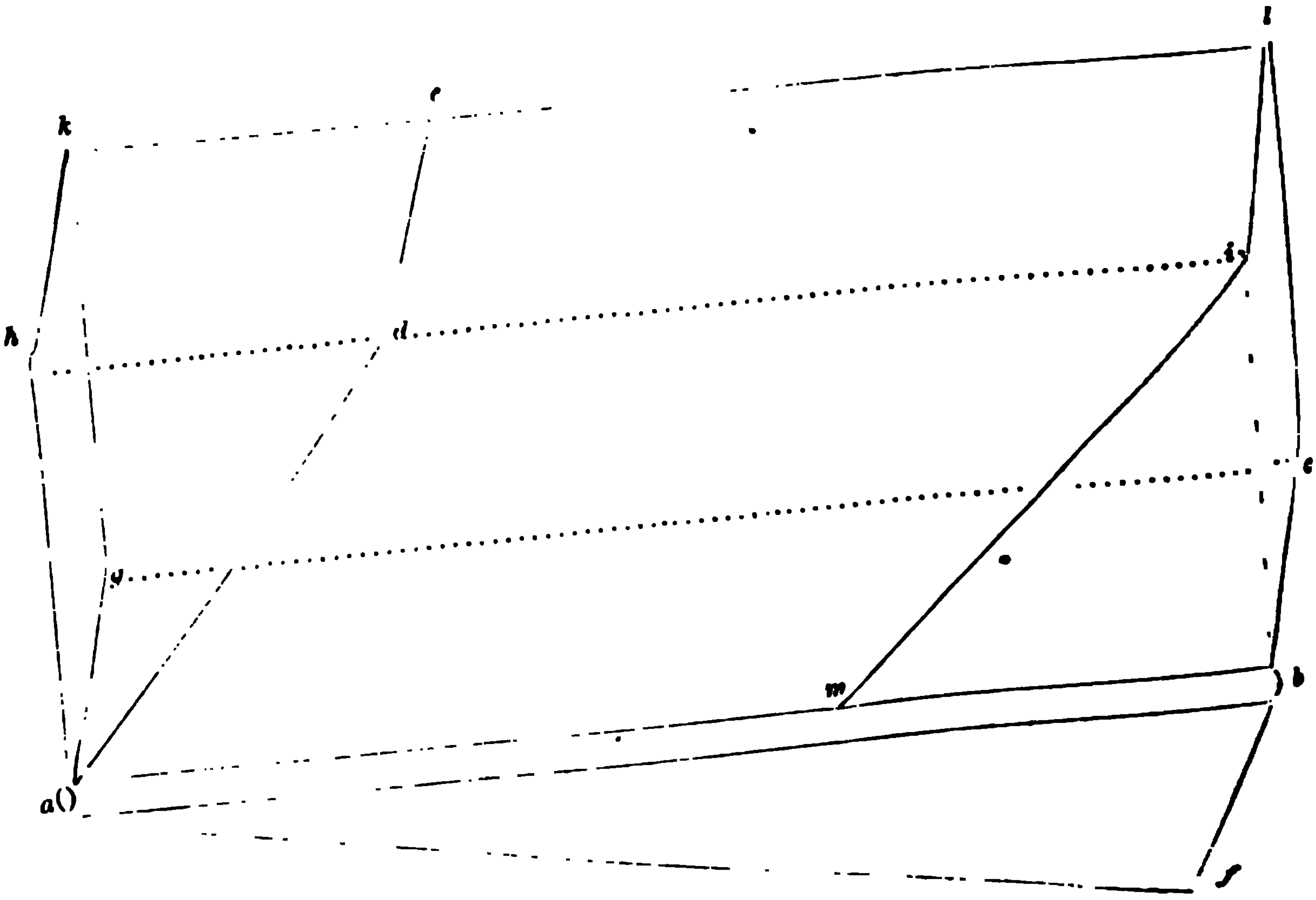
Will a pipe discharge more water, with a depth of 48 inches of earth on its back, than it would were there only 30 inches? To this question parties, strange to say, give different answers. A, B, and C here cast out by the way like aliens, each supporting his own dogmas with all the pertinacity of the old school. The disciples of Zeno never clung closer to the oracles of their master than do they to the *ipse dixit* of their leaders. A Parkes has said it, and therefore controversy on the subject is sacrilegious. Once on a time, so runs the story, two fishermen's wives were returning home; the one had a peck of meal in her creel, the other's was empty. The empty creel could not keep pace with the peck of meal, therefore its owner solicited of a herd, in passing him, to put a stone into her creel. But no sooner was the stone put into her creel, than she outstripped her antagonist. Wherefore, water will flow faster in a pipe, with 48 inches of earth on its back, than it would with only 30 inches. If this is not logical, it is at least as practical as many arguments which we have heard adduced, and many experiments also to prove, that a drain 48 inches deep will discharge more water than one only 30 inches, the former having the smallest pipe, using popular phraseology in its current sense. Having thus heard practice, let us now hear what science has got to say on the subject. Unfortunately, however, for us, here science has never been consulted on the subject. The simple definition of a drain in agriculture has not even been advanced by her. We have turned a deaf ear to Torricelli, Venturi, Bernouilli, Bony, Newton, Gregory, and others, and therefore she condescends not to open her mouth on the subject, but leaves us to grope our way in the dark, amid the conflicting elements which we have just been describing. We must look otherwise to our own conduct, and see that our experiments are the legitimate offspring of science and practice. We cannot plead ignorance of, nor do we differ on, the motion of fluids in various channels, such as rivers and pipes, in the other branches of hydraulics, nor of the laws which govern the same. Why then sit squabbling about the motion of water in the draining of the soil, and the discharge from different drains, in a manner so discreditable to British agriculture? Simply because of a natural but sceptical unwillingness to believe that certain branches of science have any legitimate connection with the plodding industry of those upon whose shoulders the cultivation of the soil devolves. Whereas these are more particularly the province of the agriculturist than any other artist, especially in the department of draining, where, perhaps, it is least expected. This arises not more from the diversity of soils, noticed in our last article on this subject, and the like, than the fact that the operation of draining is a work performed below the surface of the earth, and hence scarcely subject to our senses, although in active progress. For instance, A opens a cut 48 inches in depth, the length of his field, and into

this cut he places a pipe; but no sooner is this done than he covers up the same, and in a few seasons the place where the pipe is, is not perceptible to the natural eye. How then can A pronounce judgment in any question of difference as to discharges? The eye may discern a drop of rain-water fall upon the ground, but unless it can follow this drop in its progress to the pipe, and throughout its length, the experiment goes for nothing; and we are sorry to say that on this important point half our experiments may be set down at less value than the fireside opinions of many a winter evening. Doubtless they are facts; and this gives to them a practical currency in the eyes of many, which they do not otherwise possess. According to science, they are illegitimate elements misapplied by the mind in arguing the question as to whether a drop of water will pass through soil 48 inches in depth before it will pass through 30 inches of the same soil! In short, as to whether the greater or less of two things is the least. We have frequently heard parties complain of too much of theory and too little of practice in discussing this subject, but when we find ourselves stopping short on points of this kind, we are driven to the opposite conclusion, that more theory is wanting—but theory of a different quality—something which can legitimately be united to practice. We must depend less upon our own self-righteous notions, and it may be experiments, and more upon the experimental deductions of the last two centuries, before we can declare progress in the march of improvement. Torricelli, Venturi, Gregory, and others, must no longer lie upon the shelf shrouded in the cobwebs of ages. We must bring the philosophy of the past as well as the present to bear upon the subject, before differences so conflicting can be reconciled to each other, as those we have now been mentioning. It is true that we have previously admitted that experiment is wanting; but what is experiment but the reduction of science to practice? If we therefore wish perfection in practice, let us endeavour to approximate as closely as possible to perfection in theory; and in doing so let us first settle the open question—What is the difference between the depth of the farmer's drain and the diameter of the parson's pump? In short, let us begin at the A B C of the subject—the simple definition of a drain—and by doing so we have a right to cherish the prospect of arriving at our spelling-book in due course of time.

A drain is any channel by which water is removed from one point to another.

According to this definition, drains are instruments possessing internal capacity, lateral and longitudinal, and may be divided into two classes—natural and artificial. The nature and character of each class will materially depend upon the class of soils with which they are connected—for water may be removed from one place to another by gravitation, capillary attraction, evaporation,

—by the rootlets of plants, and by affinity and chemical combination. Now, water will only gravitate through pervious soils; it will only rise to the surface, contrary to the laws of gravitation, in capillary soils; and in the case of impervious soils, according to hypothesis, it can only flow upon the surface, or be removed from it by evaporation or chemical agency. In further prosecuting the subject, therefore, we shall first briefly discuss the general characteristics of both these classes of drains in connection with the different kinds of soil; and in order to exemplify the subject more clearly, we shall have recourse to the accompanying diagram,



where *a b* represents an artificial drain or pipe put into the soil four feet in depth from the surface, where *c g* represents the surface of the soil immediately over the top of the drain, *k e l* the surface at the centre of the ridge, *c l* the surface at the upper end of the half ridge, and *g k* the surface at the lower end. Again, let *h d i* represent the bottom of the drained soil at the centre of the ridge, and *a h* and *b i* that at the lower and upper ends respectively of the half ridge: let *b a f* be the angle of inclination of the drain, *b a d* and *b m i* angles of drainage, *b c* and *a g* percolating tubes directly over the drain, and perpendicular to the horizon and to *a f*: let *l i m* and *e d a* be percolating tubes removing the water from the surface at the centre of the ridge and conveying it to the artificial drain *a b*, and let the parts *l i* and *e d* of the percolating tubes *l i m* and *e d a* be also perpendicular to the horizon. This diagram thus will serve for both classes of drains in the different kinds of soil, and reference therefore will be made to it under each division of the subject.

1. *Natural drains* are such as are formed without the interposition of art, and are of two kinds—" open," and " under."

Open drains are formed in the bottom of hollows and valleys, by the operation of flowing water. The fundamental principle of the equal pressure of water must be familiar to every one. Water cannot be gathered into a heap like earth in a mole-hill or mountain. If it issues forth from the interior of the earth, as in the case of springs, or falls upon the surface, as in the case of rain, it will make its escape some way to the lowest level, which, generally speaking, is the ocean, and which is neither more nor less than an accumulation of water itself, occasioned by this very principle. Particles of water press horizontally with a force equal to the force with which they press downwards to the centre of the earth. They are so small and fine in quality that one particle will not rest vertically upon the top of another, so to speak: the uppermost will glide to the one side or the other. They will only rest beside each other in a horizontal position. Water has a natural tendency to preserve a uniform levelness of surface. Until this is obtained, its particles will continue in motion, actuated by this principle. If it springs to the surface of any inclined ground, or falls upon it, it will flow down this inclination to the bottom; and if there is a valley here having opposite inclined grounds from which water also is descending, and if this valley inclines at an angle to the horizon, the accumulation of water will flow along the lowermost part of it, scooping out a channel or natural drain for the removal of this volume of water from its upper to its lower extreme. Rivers, therefore, are natural drains. Thus the Thames, the Forth, and Liffey are drains of this class, art having had little or nothing to do in their formation, generally speaking.

The power which water possesses in scooping out the channel of a river, will depend upon two things—its volume or quantity of water, and velocity. In practice we are familiar with the fact, that deep and rapid running rivers in hilly countries, if by any means diverted from their courses, do more harm than shallow and slow-winding ones in level and champaign. We are familiar with the effects produced—the agent which produced them—but not the power applied. The former two are obvious to the senses, but the latter is not so perceptible. That power, however, is applied, we are equally satisfied. In determining this point, therefore, the faculties of the mind must be brought to bear upon the subject: hence the diffidence experienced by practical men in taking it up.

1°. The quantity of water in a river cannot be determined by the naked eye. There is perhaps nothing so deceptive as the depth and breadth of a sheet of water spread out before us. The evidence of the eye, however familiar with water, is insufficient to enable the mind to pronounce judgment in the case. Other auxi-

liaries must be summoned to our assistance: both the depth and breadth of the river must be ascertained by measurement.

2°. The velocity of the river will depend upon its depth, and the inclination and smoothness of its channel. It is not more necessary to observe this in theory than it is in practice,—for depth of volume and smoothness of channel are two as important characteristics of the drain as its angle of inclination.

If rivers flow in a straight line, or nearly so, they will invariably be found to be deepest in the centres of their channels. Toward the margin, the water gradually decreases in depth until it terminates in a wedge-shaped form. It is frequently found otherwise by the interposition of rocks, and the roots of trees, sedge, and other plants; but here we have foreign agents opposing the natural law which governs the river in scooping out its channel. Were soils uniform in quality, rivers would be uniform in the shape of the sectional area of their channels.

Rivers are not only deepest in their centres, but their velocities are there greatest. On each shore, the water may be nearly stagnant and motionless, while the motion of the current towards the middle is considerable. No difference is perceptible to the naked eye.

It is the difference of the friction in the channel of the river which the water experiences, which occasions this difference in the velocity. On each shore the friction is greater than towards the middle. In the middle, the particles of water only come in contact with the channel in one point, whereas at the margin, one-fourth of their circumference comes in contact with it. The motion of the water is not only impeded by the roughness of the channel, but by the attraction of adhesion existing between it and the materials of which the channel is composed: and as adhesion is directly as the surfaces touching, it consequently follows that, like friction, it will be greatest at the margin of the river. Both these causes operating together, account for the difference of the velocity of water in the middle of rivers.

As the difference of friction and adhesion accounts for the difference of velocity, so the difference of velocity accounts for the difference in the depth of the river. The greater velocity produces the greater effect in scooping out the channel.

Friction has been found by experiment to increase as the square of the velocity, and hence not only retards the velocity of the water on the shelving shores of rivers, but the whole volume of water in them, and frequently counter currents are produced n the river, which help to retard its own motion also. Were it ot for the interposition of these causes, rivers would acquire a elocity in hilly districts which, if brought to bear on any point, ich as at bends, would carry every thing before them. Instead f increased velocity, we generally find the reverse. From laying in eddies and whirlpools, the velocity of a river may not

be as the sine of the angle of its incidence. Increase of motion may be kept down to a certain degree at which it produces no ruinous effect. If water, for instance, flow over the ledge of a rock, forming a waterfall, its power in wearing away this ledge of rock will be as the depth and velocity of the current over it and acting upon it. The force of the water acquired in its descent from the ledge of rock to the bottom will at first be exerted against any loose materials in the way; but in course of time these will be carried off, a basin or whirlpool will be formed, and the upward pressure of the water in it will counteract the force of the waterfall,—consequently, the water will leave the basin with a velocity not greater than it had at the top of the fall. Rivers may thus play out of one whirlpool into another, without acquiring any increase of velocity, towards their confluence. In hilly districts, such as the Highlands of Scotland, or we may say Scotland generally, both nature and art take advantage of this mode of extending the velocity of rivers, as we subsequently shall notice. In level and champaign countries, the windings of rivers increase the friction, and hence retard their velocities. The effects produced in this case are different from those we have just noticed. Here the whole force of the water is brought to bear upon the channel of the river, unless diverted from it and applied to the driving of machinery, as is generally the case in England. Hence the increase of velocity, and effects produced by it, are both counteracted, and the general character of the river, in many cases, changed by the interference of art.

Although the action of water in rivers is thus counteracted, both by nature and art, and diverted from its legitimate operation—having its strength, so to speak, wasted in the whirlpool and the driving of machinery—it is continually exerted. The mill-dam may check its progress for a time, and confer upon it quietude and tranquillity; but this is only storing up its latent energies to produce a greater effect when the sluice is opened. Hence the continual change which is taking place in the course of rivers, more especially in low-lying countries, where art interposes no barrier to their natural tendency to straighten and deepen their channels; and even when brought to bear upon machinery, in the manner already noticed, they will be found to discharge more mud at their confluence with the ocean than those in hilly districts. The "muddy streams of England," and the "crystal streams of Scotland," are familiar expressions.

The power thus applied by rivers to scoop out their channels, and the effects produced, will depend more upon the quality of the soil through which they pass, than their angles of inclination; and the effects produced in a given time will be different, at different times or periods of their history. In the early period of the history of Scotland, the effects produced by her rivers had been greater than they are at present, taking into account the inter-

position of art, while in the champaign provinces of England the reverse had probably been the case. In the former division of the kingdom, as in Wales, and the hilly provinces of the latter, the banks of rivers, and the immense ravines through which many of them roll, indicate ravages of no ordinary magnitude having been performed at a previous period. We ourselves have drawn a plough-furrow, in order to divert water from its natural course in the reclaiming of land, and in a few seasons the water which it removed scooped out an impassable gulf. After a few years it stopt short in the progress of havoc which it formerly made, from the immense number of large stones accumulated along the bottom of its channel, and the number of eddies and whirlpools formed. These counteracted the impetuosity of its force; its strength became wasted in whirlpools, and impinging against stones too large for it to overturn, and too fast embedded in the more solid clay. The light material is soon removed and carried to the bottom of the hill, filling up the valley and reducing the angle of inclination of the mountain torrent. The heavy materials left behind form a series of cataracts along its course, so that the very cause which produces the effect, and which has a natural tendency to exercise its power and perpetuate its work, constructs the means of counteracting it. The upward pressure of the water in the basin of the waterfall, balances the momentum of the descending stream, and restores the whole to a state of equilibrium in the whirlpool. The foaming torrent, tossed from the top of the precipice into the troubled abyss below, leaves it tranquil and without a bubble on its surface.

When the soil through which the river passes is composed of gravel, and free from rock, and when the angle of inclination is less, its features are somewhat different from those above noticed. The foaming torrent may cease to exist; but still we have the same agent in active operation, and similar effects produced—the same, or, it may be, an increase of power from an increase of volume continually exercised, and as continually counteracted by similar means. This may be seen exemplified in the generality of Scottish rivers after they emerge from the Highlands into the Lowlands. Instead of playing over rocks and abrupt precipices perpendicularly, we have now the stream rolling down a series of inclined planes into a corresponding series of whirlpools. We have now, we say, introduced to our notice the theory of two angles of inclination in the same plane, differing in size—the greater brought forward by nature, so to speak, in order to obviate the evils arising from an increase of velocity, which would be acquired by the lesser in flowing down the less. Paradoxical as this may appear to be, it is no less paradoxical than true; and, in order to show it, it will be necessary to discuss more fully the motion and pressure of water.

Water, like all other bodies, has a natural tendency to gravi-

tate directly to the centre of the earth. This principle is in active operation in all rivers. When diverted from this perpendicular line to the earth's centre, water acquires a tendency to move in the same plane horizontally. If in this plane it impinges against any solid body, it will be deflected from it in a straight line. Water, therefore, has a natural tendency to move in straight lines, perpendicularly and horizontally.

When water, however, in any stream acquires velocity, this velocity has a natural tendency to counteract gravitation; and from two forces thus acting against each other, instead of flowing in a straight line, it will, in obedience to the laws of projectiles, describe a parabolic curve. Attention to this is of the utmost importance, in calculating results in practice—for the stream, when projected over a precipice into the whirlpool below, or over the top of a stone or other solid body in its channel, does not fall perpendicular to the centre of the earth, but in a direction varying less or more from it. The power which the stream thus acquires to scoop out its channel is not perpendicularly exerted, even when it falls into a whirlpool. It does not strike the water in the basin at right angles to its surface in the plane of its direction, but obtusely outwards.

Analogous to this is the curvilinear motion of water to be accounted for in every slow-winding stream. In consequence of water flowing at different velocities in different parts of the stream, and its deflection from a shelving shore instead of moving in straight lines, the different particles impinge upon each other, so as to give to their course, if not a curvilinear form, the nearest approximation to it. Instead of moving in curve lines, when the banks of such rivers are steep, irregular, and, it may be, undermined and overhanging them, the water is to be seen boiling, as it were, in a caldron. This phenomenon is to be accounted for, from the water being deflected backwards in direct opposition to the stream. At other times, an eddy may be formed from water flowing in different directions, and with greater velocity at the bottom than the surface of the stream—sometimes the water may play upwards from an opposite cause. Islets, piers of bridges, sandbeds, and such like, again confer upon rivers peculiar characteristics in every respect, whether we look at the line of their course, or the motion of their waters.

As water is subject to the same laws of motion as other bodies, it necessarily follows that in falling from a precipice as in the case of a waterfall, its motion will become accelerated — hence *the velocity at different depths will be as the square roots of those depths.* Thus at the depth of four feet, according to experiment, the velocity will be about 16 feet in a second, and at the depth of 16 feet, about 32.

The velocities acquired by water in flowing down inclined planes of unequal angles of incidence, will be as the square roots of the sines of those angles of incidence.

If we suppose that $a\,b$ in the diagram is the course of any river, as the Tweed, $m\,i$ one of its tributaries, $b\,a\,f$ the angle of inclination of $b\,a$, and $b\,m\,i$ the angle of inclination of $i\,m$, $b\,f$ the sine of the angle of inclination of $b\,a$, and $b\,i$ the sine of the angle of inclination of $i\,m$. Then the velocity of $a\,b$ at a will be to the velocity of $m\,i$ at m, as the square root of $b\,f$ is to the square root of $i\,b$, or if we substitute x for the velocity of $a\,b$, and y for the velocity of $m\,i$, then $x : y :: \sqrt{b\,f} : \sqrt{i\,b}$.

Torricelli, two centuries ago, made the important discovery, and laid down the theorem, that "particles of fluid, on issuing from an aperture, possess the same degree of velocity as if they had fallen freely *in vacuo* from a height equal to the distance of the surface of the fluid above the centre of the aperture." And it will readily be perceived that the above is taken from it. It is susceptible of practical and theoretical demonstration, thus—

Let $b\,a\,g$ be a lead pipe of any diameter, bent at a right angle at a to $a\,f$, and let $a\,g$ equal $b\,f$. Then, by hypothesis, $a\,f$ being parallel to the horizon, and $a\,g$ and $f\,b$ perpendicular to it and equal to each other, the points b and g will be in a plane parallel to $a\,f$; consequently, if the pipe is filled with water, it will stand in both limbs to the points b and g, so that the pressure of the column of water in $a\,g$ balances the pressure of the column of water in $a\,b$; therefore water will issue from an orifice at a of the tube $a\,g$ with a velocity equal to what it would issue from an orifice at a of the tube $a\,b$. But the velocity of the water in issuing from the orifice in $a\,g$ is equal to what it would have been had it fallen freely *in vacuo* from g to a. Now $g\,a$ is equal to $b\,f$, and the velocity of the water in issuing from the orifice in $a\,b$ equal to the velocity of the water in issuing from the orifice in $a\,g$; consequently the velocity of the water in descending through the pipe $a\,b$ will be equal to what it would have been had it fallen freely *in vacuo* from b to f. But $b\,f$ is the sine of the angle of inclination of $a\,b$. In a similar manner it may be shown that the velocity of the water in descending through any other pipe as $m\,i$, will be equal to what it would have been in falling freely *in vacuo* from i to b, the sine of the angle of inclination of $i\,m$. Wherefore, substituting x for the velocity of the water in $a\,b$, and y that in $m\,i$ as formerly (by the first theorem given above,) $x : y :: \sqrt{b\,f} : \sqrt{b\,i}$; or, if we take $b\,f$ at 4 feet, and $b\,i$ at 16 feet, then, according to experiment, x will be equal to 16 feet in one second, and y 32 feet, so that we have $16 : 32 :: \sqrt{4}\ (= 2) : \sqrt{16}\ (= 4,)$ and *vice versâ* $2 : 4 :: 16 : 32$.

The above, although strictly true both in theory and practice, that the pressure of the water in the two limbs of the bent tube balances each other, and that consequently the velocities from each will also be equal, is only true of the first issue, especially if the diameters of the orifices are equal to the diameter of the tube; for ... moment the whole of the water in each limb is in motion, the ... against the surfaces of the two will be different. It will

be greatest in the longest limb $a\,b$. In the case of rivers we are familiar with the fact, that the velocities at their edges are less than at their middle, as we have already noticed; and although imperceptible to the eye, the same is the case in tubes. In both cases the same laws of motion and matter are experienced. Nature has no exceptions. Of the friction of water in tubes we shall have occasion to speak more particularly afterwards. We have chosen the tube in this place as being the most familiar, practical, and interesting example; but the same results might have been deduced by supposing the water in the river to have been dammed back by a sluice. Under such a hypothesis, the water would have risen to the top of the sluice, say $g\,a$, so that the water would have stood with a level surface from g to b. In this case the pressure and velocity at a would have been equal to what they were in the case of the bent tube.

We are familiar with the fact we have said, that the velocity of a river is greatest at the middle; but from the above theorem it will appear obvious that the velocity at the bottom is greater than at the surface. This fact, although not so perceptible to the eye, may frequently be observed from bodies in rivers at different depths moving with different velocities. At all times it is susceptible of experimental proof, by making a staff or rod sail down the river vertically through the instrumentality of a board and axis through the rod. The bottom of the rod immersed in the river will move faster than the board, and the top of it will bend consequently backwards against the current. From the above theorem, if we suppose the sine of the angle of inclination to be 4 feet, and the depth of the river 16 feet, then the velocity at the surface will be less than the velocity at the bottom as $\sqrt{4}$ to $\sqrt{16}$, or as 2 to 4. The velocity at the bottom in this case will therefore be double of what it is at the top, or on the surface.

The above hypothesis, it must be observed, however, is strictly a theoretical one, and is only applicable to practice in the case of the water at the bottom getting a free vent, as over a precipice. At the confluence of rivers with each other and with the ocean, this velocity at the bottom is counteracted in the vast majority of cases. If, however, we take a point in the bottom of the channel of a river on a level with the surface of the ocean, or the surface of the main run of the point be in the bottom of its tributary—then above this point, if no similar counteracting force interposes, the rule will be applicable; but invariably in practice interposing agents, such as deep pots or whirlpools, in rapid running rivers, and the bends of slow winding ones in level countries interpose, which leads us next to examine such agents, and the interposition which they present—in other words, the equal pressure of water already referred to, and natural weirs or dams formed in rivers, and the obstruction which these present in their channels.

Water is governed by a law of pressure peculiar to itself and

other fluids, independently of gravitation. This fundamental principle is the tendency which its particles have of pressing equally in all directions vertically and horizontally, as well as perpendicularly. In any vessel or pipe, such as the tube *a b* in the diagram, if filled with water, the pressure against the bottom at *a*, in the direction of its length, will not be greater than against every point in its circumference at the bottom. The lowermost section of particles do not exert a greater pressure upon the bottom horizontally than vertically in the direction of *a g*. Wherever two particles of water touch each other, the one will communicate a pressure to the other equal to what is communicated to itself, and the second will communicate the pressure received to the third or any solid body coming in contact with it, as the interior surface of a pipe or channel of a stream; and this pressure is not only exerted in the line of its direction, for the first particle pressed upon will communicate the pressure to all the particles which it touches, and this law will be enforced among all the particles in the mass.

The pressure of a column of water is as its vertical height and the area of its base, or the pressure on the area of the base of a column of water is as its vertical height. The pressure on the base, therefore, is not diminished or increased by reducing or increasing its area, but the vertical height of the column of water.

It is this difference in the pressure of water at different depths which suggests to us the propriety of making embankments and dams broader at the base than at the top.

If the column of water presses horizontally instead of vertically, as in the case of pipes and rivers, the pressure at the lowest end of the pipe or river will be as the sine of the angle of its inclination, and sectional area of its current. From what has been said, we need hardly illustrate this by reference to the diagram. If *b a* is any pipe full of water, the pressure at *a* is not as the length *a b*, but the sine *b f* of the angle *b a f*, for *b f* is equal to *g a*, and a column of water *g a* will balance *a b*; therefore the pressure of *a b* is as the sine of the angle of its inclination.

From these two theorems we are enabled to investigate two important questions in practice,—*First*, The flowing of rivers into pools in their channels, and the manner in which their velocities are retarded by it; and *second*, The flowing of one stream into another.

First, If a sluice is opened, and the stream rushes down a precipitous place into a standing pool, the first impression made upon the eye is, that it is driving the whole water in the pool before it. There is something deceptive in this appearance, as in viewing the waves of the ocean. If we stand on the headland, we perceive wave after wave rolling towards the shore; but the fact is imaginary—so is it in the case before us. At first the pool is not prepared to receive the impulse of the stream, so to speak; before it is so, its depth must be increased. This accomplished, an equi-

librium will be restored, and the motion of the river will entirely be subdued. The first effort on the part of the pool is to increase its depth, and the fact of the rising of the water into a wave before the current of the stream, is the opposing of one force to counteract another, by the laws of the equal pressure of fluids. If the sine of the angle of inclination down which the stream rushes into the pool is four feet—the depth of the stream itself four feet, and the depth of the pool sixteen feet at the centre, and sloping towards its shores at the above angle, then the stream would enter the pool with the velocity of upwards of sixteen feet per second, and a pressure equal to that of a column of water eight feet high. To counteract such a pressure would require a very powerful opposing force: instead of which the reverse is presented. The pool is attacked on the weakest and most defenceless part. As the stream penetrates towards the centre, the case is different. Here it is met by an equal, nay, a superior foe—a depth of sixteen feet to eight—and therefore, before it gets this length, its velocity is wholly counteracted. Its waters then rise to the surface, and glide smoothly to the outlet of the pool on the opposite side.

The phenomenon is similar when the stream falls into the pool almost perpendicularly, as may be seen exemplified by pouring water into a glass. If the stream strikes the bottom of the pool, it will have a tendency to increase its depth; but here there will be a limit, beyond which no effect will be produced; for as the pool increases in depth, its pressure upwards against the stream will also increase, until it wholly counteracts its force.

It viewing the depth of pools, and the natural dams thrown across rivers which form them, we are apt to associate both with the ordinary state of things. This, however, is not the true position of affairs. Were rivers not increased by winter floods, they would assume a very different appearance from what they generally do. It is the heavy winter floods which confers upon them those characteristics now under discussion. *Ten*, or, what is probably more near the mark, *twenty times the power* on such occasions is brought to bear upon the formation of the pool, and weir across its lower entrance, than what ordinarily plays into it; but the greater the power applied to produce an effect, the greater are the means exerted to counteract it. Thus, nature in this case, as in all others, adapts herself to her own necessities; for as the work of excavation goes on in the bottom, the excavated materials rear the dam, so that the pool increases in depth, both upwards and downwards, until it finally attains power sufficient to counterbalance the heaviest winter flood.

But from the continual and incessant operation of the water, the strength of safety dams are daily reduced, and hence the changes which take place in all rivers.

The power which water possesses to scoop out pools, and form

dams, will readily be perceived to be great, when we consider the fact, that stones are lighter in water than in the atmosphere, by its own weight, or the weight of water displaced by the immersed stones. If a cubic foot of water is displaced, the apparent diminution of weight will be 1000 ounces, or about $\frac{2}{5}$ of the weight of the average kind of stones. When we add to this buoyancy of the stream its velocity under heavy floods, we have more reason to be surprised why greater effects are not produced than what there are, and the fact can only be accounted for by the counteracting agency of the deep safety pools already noticed.

Second, The confluence of rivers present many interesting phenomena to the mind of the student, and to none more than the drainer. Here nature unfolds her operations to the naked eye without a covering, and hence we have no divisions on the subject; but when we come to examine under-drains in the soil, the case is very different. There the candle is placed under a bushel: hence the difficulties experienced in discovering the light, and the jarring differences amongst us. In nature, however, we find no differences nor jarring: the same laws which govern the motion of water, operates in the one case as in the other. The water in the open river is urged forward in its course by the same active agency as the water in the artificial drain under the earth's surface. We have nothing in the one case to accelerate or retard motion which we have not in the other. In rivers we have seen that velocities are greater in the middle than at the edge, because of the friction against their sides. Particles of water flow more freely among each other than when rubbing against any solid body. The velocity, again, is greater towards the bottom than the surface, because of the difference of depth and pressure; and we have also seen, that the whole velocity of the stream may be counteracted by flowing into a pool, naturally formed in its channel. We now come to examine the phenomenon of two streams, the one flowing into the other, and we shall in this case suppose, *first*, that the depth and velocity of each are equal, but their volumes different, so as to resemble a river and its tributary.

Were it possible to suppose an example of the one river meeting the other directly counter to the line of its course, the one velocity would counteract the other. At the point of contact a ridge would be formed like that where rivers meet the tide of the ocean, and the phenomena would be exactly similar, substituting the large river for the ocean. If, again, we could suppose the counter of this—the two streams to flow directly in one line—the counter effect would be produced, the velocity of the large stream will be increased. If, however, we take a mean between the two, and suppose the tributary falling into the other at right angles to the line of its course, then a mean between the two former effects will be produced, and proportionally greater or less, according to this angle which the two rivers make.

The effect produced will only be at the confluence of the two streams, for the waters of the tributary will seldom do more than penetrate to the centre of the other. Its pressure here will be equally upwards against the current of the other as downwards in the line of its direction. This upward pressure will be counterbalanced by an increase of the altitude, or tailing back of the waters of the main river. The confluence of the two rivers, in short, will be elevated above their natural level, so to speak, or that level which they would have preserved had they not come in contact with each other; consequently, at the point of contact, the velocities of the two will be less than at two points farther up the respective streams. The increase of depth, however, will have a tendency to increase the velocity of the main stream below the eddies, and reverberations of the particles of water, where it is joined by its tributary.

If the tributary shall roll down gravel, or other material into the channel of the other, filling it up so that its breadth only is increased, and not its depth, its velocity may be less below the point of junction than above it.

The phenomena which take place when the velocities of the two streams differ, are almost similar to those when no difference exist, especially if that of the tributary is least. If the velocity of the tributary is the greatest, its waters will only penetrate farther into the centre of the main stream, and elevate the surface at the confluence of the two proportionally higher.

The manner in which the motion of rivers is extended by the action of their tributaries flowing into them, may be seen exemplified in the field of the farmer any rainy day, where the old system of furrows and gaw-furrows remain in force. The gaw-furrows here is the river or main drain, and the common furrows between the ridges of the field its tributaries; and although these, properly speaking, are artificial drains, and hence belong to a different section of our subject, yet, as they partake something of the natural order, we shall include them here. That the action of the common furrows playing into the gaw-furrows retards the velocity of the water in the latter, is a fact which we believe few farmers will deny, and that the causes which retard the motion of the water in the gaw-furrows, are those which we have noticed, we are sure will also be accredited. In weighing agricultural produce, we are familiar with the fact, that two things must be equal, the weights in both scales, however dissimilar in appearance those things may be in other respects. Difference of opinion is here precluded. The balance determines the question. In the field we differ on draining! Why? Are facts more excluded from our observation Not in open furrows and gaw-furrows: here facts are as perceptible as in the weighing of flour or other products of the farm. If the motion of water, therefore, is accelerated or retarded in the furrow, or is different in different furrows, how do we

account for it? The simple facts of the differences of the length of the furrows, and the water playing from one furrow into another, are insufficient. If, in weighing a stone of flour, we throw 7 lb into the scale from a distance, say in a small bag, it will counterbalance for a time the 14 lb in the opposite scale. Now, we do not impute this to the distance thrown, or the simple fact of it having been thrown, but to the "force." This force is equivalent to 7 lb or upwards. An equal force would have been acquired if the 7 lb of flour in the small bag had fallen freely from a height perpendicularly into the scale, a force which can be estimated from the weight of the falling body, and the height fallen, independently of the balance—so can the increase and decrease of the motion of water in open furrows and gaw-furrows be estimated. Here we stop for the present.

THE FARMERS' NOTE-BOOK.—NO. XXIX.

The Chemical Composition of Quinoa Seed. By Dr Augustus Voelcker, Professor of Chemistry in the Royal Agricultural College, Cirencester.—The botanical name of the plant from which the small and mealy quinoa seeds are derived is *Chenopodium Quinoa.* It belongs to the natural order of the Chenopodiaceæ, of which spinach and beet may be taken as the more familiar representatives. Chenopodium quinoa, like all chenopodiaceæ, is an apetalous plant, with minute green herbaceous flowers, appearing in close clusters towards the ends of the branches. In good lands, it grows upwards of three feet, and produces small white or dark coloured seeds, which, ground down to flour, furnish a nutritious and wholesome article of food to millions of people. Though the leaves furnish a wholesome vegetable, similar to spinach, it is chiefly on account of the farinaceous seed that the plant is cultivated in many parts of South America. Before the introduction of our cereals into Peru and Chili, the quinoa was much more extensively cultivated and regarded by the Peruvians, whose chief food it formed—of as much importance as the potato or wheat to us, or the rice to the Indians. It is still cultivated in Peru and Chili, and in other places in South America, in localities where wheat, barley, oats, or rye refuse to grow. Meyer, to whom we are indebted for the above remarks on the quinoa plant, in his *Geography of Plants*, p. 302, mentions, that, over all the plateau of Southern Peru, above the height at which rye and barley still ripen, the chenopodium quinoa is the principal object of agriculture; and that, on the plateau of Chuquito, almost 13,000 feet high, vast fields are quite covered with the plant, which, however, he says, do not give the landscape the charm of our beautiful green corn-fields.

There appear to exist several varieties of quinoa seed, differing in colour, size, and taste from each other. The most common kind is a round, farinaceous, small seed, of the size of millet, and

possesses an agreeable taste, and no perceptible smell. Crushed between stones, it is reduced to meal, which is used by the Peruvians, boiled as soup or frumenty, very much in the same way as rice is prepared.

Quinoa meal makes very good porridge, puddings, and cakes, but, like oats, it is unfit for the baking of bread.

Chenopodium quinoa is not usually grown in this country; but as it is an exceedingly hardy plant, and furnishes a highly nutritious seed, as I am inclined to infer from the subjoined analyses, it might perhaps, with advantage, be planted in localities where cereals and even buckwheat refuse to grow. For that reason I thought it not altogether superfluous to examine this seed, with a view to determine its nutritive powers. I am not aware of any analysis of quinoa; and as many people in South America are chiefly dependent on its use, the subjoined analysis, at all events, I trust, will not be altogether devoid of interest.

I have just mentioned that there are several varieties of quinoa. That which I analysed was grown on the estate of Mr Milne, of Milnegraden, Berwickshire, who kindly furnished me with the material for the analysis. In its outer appearance, this seed cannot be distinguished from the common quinoa; but its taste being slightly bitter and somewhat acrid, it is called bitter quinoa. The bitter taste, however, I found, on experiment, can easily be removed entirely by digesting the whole seed with a very dilute solution of carbonate of soda, which dissolves the bitter principle, the exact chemical nature of which I have not ascertained. My experiments lead me to regard the husk as the seat of the bitter principle.

When perfectly ripe, the seed is easily reduced to powder, and then furnishes a white meal, with a tinge of yellow, which possesses no smell, and a slightly bitter and rather acrid taste. Made into a dough with water, the mass is not rendered very elastic or tenacious, like wheaten flour under the same treatment. Quinoa meal, in this respect, resembles oatmeal, and, for that reason, it is unfit for the making of bread. Gluten, which gives tenacity and elasticity to the dough of wheaten flour, is retained on a piece of muslin when the dough is washed carefully with small portions of water at a time: the dough made of quinoa meal, treated in the same manner, leaves the impure husk of the seed on the muslin—which impure husk is not sticky, as it would be if it contained much gluten; and it appears, therefore, that quinoa seed contains but little gluten, if any. If the milky liquid which passes through the muslin, tied over a glass beaker, is allowed to settle until all starch has subsided at the bottom of the vessel, which requires several days, on account of the small size of the starch granules and the mucilaginous properties of the liquid, a clear, slightly yellow fluid is obtained. Heated to the boiling point of water, this clear liquid deposits a few flakes of coagulated albumen. These having been separated by means of a filter, a few drops of acetic acid produce

an abundant, white, voluminous precipitate, showing the presence of a large quantity of soluble protein compounds, analogous, if not identical, with legumin, or vegetable casein. I have not submitted this substance to an elementary analysis, and only studied its reactions with chemical re-agents. These, however, distinctly proved that it was identical, in this respect, with a substance, obtained under the same circumstances from oats, to which Professor Johnston has given the name of *Avenin*. Insoluble protein compounds are likewise present in quinoa seed; and their presence is readily indicated by treating the impure husk remaining on the muslin by the washing process with a dilute caustic potash solution, filtration, and addition of acetic acid to the clear solution, when a white, flaky precipitate will make its appearance. The powdered seed, boiled with ether, furnishes a yellowish ethereal solution, which, after the ether has been distilled off, leaves a yellow, semi-fluid, fatty oil behind.

In the state in which the quinoa seed was obtained for analysis, it contained 16.017 per cent of water.

My attention was first directed to ascertain the nutritive properties of quinoa meal. The nutritive qualities of farinaceous articles of food are usually and best determined by ascertaining the quantity of nitrogen, and calculating the amount of protein compounds, on which their nutritive value chiefly depends, by multiplying the percentage of nitrogen obtained by combustion with 6¼. I shall therefore, in the first place, state the results of two nitrogen determinations:—

	First Experiment.	Second Experiment.
Percentage of nitrogen in the whole seed in its natural state, (containing 16.017 of water,) . . .	3.19	2.95
Equal to protein compounds, . . .	19.93	18.44
Average percentage of nitrogen, ...	3.07	
Equal to protein compounds, ...	19.18	

Quinoa seed, dried at 212° Fah., thus will contain in 100 parts,—

	First Experiment.	Second Experiment.	Average.
Nitrogen, ...	3.80	3.52	3.66
Equal to protein compounds, . . .	23.75	22.00	22.87

These two determinations correspond well with each other—the differences not being larger than those usually obtained in estimating the proportion of nitrogen in similar substances.

In the following table, the composition of the seed in its natural state, and dried at 212°, is represented:—

		Calculated dry.
Water, ...	16.01	—
Starch, ...	38.72	46.10
Sugar and extractive matters, ...	5.12	6.10
Gum, ...	3.94	4.60
Oil, ...	4.81	5.74
Casein, and a little soluble albumen, . . .	7.47	8.91
Insoluble albumen, and other protein compounds,	11.71	13.95
Vegetable fibre, (husk,)	7.99	9.53
Inorganic matter, (ash,)	4.23	5.05
	100.00	99.98

On burning the seed, a white, very fusible, and hygroscopic ash is obtained, which, on analysis, was found to consist, in 100 parts, after deducting 9.74 sand,—

Potash,	33.18	36.76
Chloride of sodium,	1.19	1.31
Lime,	2.22	2.45
Magnesia,	12.39	13.61
Oxide of iron,	1.61	1.78
Phosphoric acid,	35.20	38.99
Sulphuric acid,	3.04	3.36
Silicic acid,	1.98	2.19
Sand,	a little.	
Charcoal,	9.74	—
	100.55	100.45

PERCENTAGE OF ASH.

	First Experiment.	Second Experiment.	Average.
Percentage of ash in seed, containing 16.017 per cent of water,	4.27	4.19	4.23
Percentage of ash in seed, dried at 212° F.,	5.10	4.99	5.05

The above analyses suggest the following observations :—

1°. The proportion of protein compounds in quinoa seed is larger than in most cereals and starchy vegetable products. So far as the nutritive value of an article of food is dependent on this important class of bodies, quinoa meal deserves the preference before rye, barley, rice, Indian-corn, plaintain, and potato, and is not inferior to the best samples of wheat and oats.

2°. Quinoa seed approaches nearest in its composition to oats, with which it has likewise, in common, that it forms almost the only food of many people. This fact alone is sufficient to show that quinoa must contain everything requisite to support animal life in a healthy condition. The percentage of protein compounds in quinoa seed, on which the sustenance of the muscles is supposed chiefly to depend, is even larger than in oats. The nature of the protein compounds in quinoa is analogous, if not identical, with those in oats. Both contain, comparatively speaking, a large quantity of oil; and finally, the composition of the ashes of quinoa and oats shows a certain similarity.

3°. In so far as the supply of those mineral ingredients is concerned by which the body is supported, quinoa seed must be regarded as eminently fitted to sustain the strength of the human frame. The ash is rich in phosphoric acid and potash, and, like many seeds, more particularly farinaceous seeds, it contains a large proportion of phosphate of magnesia. Though exhibiting a general similarity with the ash of cereals, the above numbers show that the ash of quinoa approaches still closer that of pease and beans.

Coal-ashes — Wood-ashes — and Soot. By J. TOWERS, M.R.A.S.E.—It has been stated to the effect that no man is too

wise to learn, and that however instructed he may be "in all knowledge," he may yet acquire further instruction from the conversation even of the rudely illiterate.

The subject of the present notice has been suggested by the perusal of an article in No. 16 of that estimable weekly periodical *Household Words*, conducted by Charles Dickens, entitled "Dust, or Ugliness Redeemed." They who remember what the London mounds of dust and ashes really were some thirty years ago, can well appreciate the facts detailed by the writer, and recall their features to recollection—"familiar," indeed, as "household words." I well remember, even from childhood, that vast mound which occupied the angle (long ago built over) between the termination of Gray's Inn Lane and the New Road—it might, for aught I know, have been the identical mass to which the paper in question makes allusion; but, be that as it may, without dwelling longer upon authority, I take the liberty to extract so much of the article on *Dust* as I found not only to bear upon agriculture, but to favour the opportunity of introducing some remarks which are pertinent to the objects I now have in view.

As *coal-soot* is one of the ingredients which enters into the components of the dust-heap, the writer very appositely introduced the following observations:—

When soot is first collected it is called "rough soot," which, being sifted, is then called "fine soot," and is sold to farmers for manuring, and preserving wheat and turnips. This is more particularly used in Herefordshire, (query Herts) Bedfordshire, Essex, &c. It is rather a costly article, being 5d. per bushel. One contractor sells annually as much as three thousand bushels; and he gives it as his opinion that there must be, at least, one hundred and fifty times this quantity (450,000 bushels per annum) sold in London. Farmer Smutwise of Bradford distinctly asserts that the price of the soot he uses on his land is returned to him in the straw, with improvement also to the grain. And we believe him.

Lime is used to dilute soot when employed as a manure. (N.B. This is bad chemistry, whether the remark applies to the farmer or the writer, because either quick or slaked lime would inevitably decompose the neutral salts of ammonia with which coal-soot abounds, by attracting the acid they contain, and liberating the gaseous *pure ammonia*, which would then pass into the atmosphere.) Using it pure will keep off snails, slugs, and caterpillars, from pease and various other vegetables, as also from dahlias just shooting up, and other flowers; but we regret to add, that we have sometimes known it kill, or burn up the things it was intended to preserve from unlawful eating. In short, it is by no means so safe to use for any purpose of garden manure as fire-cinders and wood-ashes, which are good for almost any kind of produce, whether turnips or roses. Indeed, we should like to have one-fourth or fifth part of our garden-beds composed of excellent stuff of this kind.

Thus far our text, which may admit of the following comment:—The ashes which constitute the dust-heap are obtained chiefly from the combustion of sea-board, or land mineral coals, and they are found to amount to about from 2 to 5 per cent, in round numbers, of the original weight of the coal. The constituents of these ashes vary considerably; but all, I believe, abound with fine silex, combined with alumina, and a very small proportion of alkaline salts, so small as scarcely to effervesce with tolerably strong muriatic

acid.* Coal ashes, therefore, rank very low as a chemical meliorator of earths and soils; but applied as a mechanical agent, they have been proved to be one of the best materials which we possess to break up, and permanently improve the texture of stiff binding clayey earths. I know a large garden in Buckinghamshire, the staple of which was so heavy and clodding after rain, that it resisted every application of common sharp sand. At length a great bulk of sea-coal ashes was added, and trenched in deeply, and from that time the garden became manageable and fertile. The gardener, well known to me, had been concerned in the operation; twenty years had then elapsed, (he remained in his situation above thirty years,) and the texture of the land never deteriorated. Wood-ashes, however they may vary in their chemical constituents, are a very different thing. Let us cite the authority of Liebig's Chemistry, where, at page 183, edition 1847, we read that—

Wood-ashes lixiviated with cold water contained silicate of potash in exactly the same proportion as straw, (10 of silica acid + potassa,) and that, in addition to this salt, it contains considerable quantities of phosphates. . . With every 100 pounds of lixiviated ashes of the beech, we furnish to the soil as much phosphates as are contained in 460 lb. of fresh human excrements. According to the analysis of Saussure, 100 parts of the ashes of wheat grain contain 32 parts soluble, and 44.5 parts insoluble —altogether 76.5 parts of phosphates. The ashes of wheat-straw contain, in all, 11.5 per cent of phosphates. Thus, with every 100 lb. of the ashes of beech, we furnish to the field phosphoric acid sufficient for the production of 4000 lb. of straw, or for 2000 lb. of the grains of wheat, calculating the ashes of the former at 4 per cent, and those of the latter at 1.3 per cent, according to Saussure.

It has been observed that wood-ashes, however valuable as being rich in alkaline and cretaceous salts, *can in no case be depended upon where the soil is poor in, and requires organic manure.*

Thus, upon poor grass-lands newly broken up, their use is markedly beneficial in improving the yield of grain, and promoting the cultivation of the turnip. In this case, ashes restore the balance between the *mineral* and *organic* constituents of the soil; and, by furnishing a more liberal supply of the former, they enable a plant to use more freely the organic elements which are always in excess in a soil under this cultivation. It is also conjectured that, by their *carbonaceous* elements and gypsum, they absorb or fix the volatile *ammonia* that is present during the rapid decay of the vegetable matter.

While some persons advocate the utility of wood and other vegetable ashes, others stoutly contest their availability, and assert the folly of submitting any vegetable substances to combustion. Let us, then, without pretending to enter into the minutiæ of chemical analysis, appeal to plain matter-of-fact in the simplest mode of expression. It is well known that the forests of America and the north of Europe yield the vast amount of pot and pearl ashes introduced by commerce. These alkalies, in their caustic and

---

* Since the text was written, the following analysis of Wallsend Elgin coal has met my eye :—

	Silica.	Alumina, or oxide of iron.	Lime.	Magnesia.	Sulphuric acid.	Phosphoric acid.
Per cent	61.66	24.42	2.62	1.73	3.38	1.18

The two acids were, of course, in combination with the lime and magnesia.

mild state, are obtained by the combustion of wood, and the subsequent lixiviation of the wood-ashes so produced. They did not, however, exist simply as such in the juices of the trees while living and growing, but in a state of chemical union with some organic acid. Now, to familiarly verify the fact, take, we will say, any convenient quantity (1 oz. will do, more or less) of the white wood-ash of the bread oven, and pour over it in a cup boiling clear rain water, sufficient to cover the ash, stirring with a strip of glass two or three times, while standing for ten minutes on the hob of a grate, then transfer it to a white paper filter, in a glass or wedge-wood funnel, and receive the droppings in a tumbler-glass, adding at times small quantities of fresh warm rain or distilled water, till the drops fall without perceptible salt taste. A strip of yellow turmeric paper dipped into the liquid will instantly acquire a dingy red, proving the presence of a vegetable alkali, which has been extracted from the wood-ash by lixiviation. If the clear liquid be exposed to a gentle steady heat, in a place where no dust or extraneous matter can enter it, till all its water is driven off, the saline matter will remain in a solid form, and its weight can then be ascertained. Thus an approximative estimate of the proportion of alkaline matter contained in any given weight of ashes can be formed. But in addition to the salts thus soluble in water only, a quantity of cretaceous matter will be detected by treating a given weight of the ashes with dilute muriatic (hydro-chloric) acid, 3 parts of rain-water to one of the strong acid, till hissing cease. The fluid is then to be passed through a filter, and the matter not dissolved (which is chiefly silicious sand,) washed till the drops fall without any perceptible taste. By adding a solution of carbonate of potash to the strained fluid drop by drop, carbonate of lime will fall, and can be washed, dried, and weighed. Again, if, before using the carbonate of potash, the clear liquid be tested by a few drops of watery solution of prussiate of potassa, (*ferro cyanide* of potassium,) a blue tint of considerable intensity will be obtained, proving the existence of iron in the ashes. Experiments so conducted can have no pretensions to chemical refinement, but they are still very useful, not only by exhibiting in the rough some of the elements which must have been present, but also by proving to demonstration the real value and importance of a science which alone is competent to reveal and accurately calculate the quality and quantity of those secret and heretofore concealed matters, which contribute to the fertility of arable grass and garden lands.

But here the vexed question presents itself—Does the process of combustion by which wood, vegetable matter, bog-peat, &c., are reduced to ashes in any way, yield fertilisers to the land? I know that many have, or had, an insurmountable objection to it, on the ground that every element required by vegetables is, and would be, returned to the earth by incorporating with such matters in a

state of fermentation—or, indeed, as green manure. It must be ceded that potash, soda, lime, oxide of iron, or any other inorganic mineral matters, are never found in the juices or tissues of the living plant; there *they are*, however, but always in a state of combination, as before observed, produced by vital electric action. By combustion there is a loss of all the organic portions of vegetable or animal substances, and even during the fermentive putrefaction of the dung-heap—which is, in fact, a gradual process of combustion—a considerable loss of substance is incurred; still, however, the matter which is the base of *humus* remains in the heap of spit-dung; and humus, it is acknowledged by all, is required to be present in every fertile soil. Much, therefore, remains to be said on both sides, yet we may be quite sure that, as lime is useful in reclaiming peat-bogs, in the correction of acidity wherever it exists, and in neutralising an excess of humic acid in garden ground *glutted* with over-manuring, so the ashes of burnt vegetable matter, being rich in alkalies, must act remedially in all acid soils. And they also are inimical to molluscous insects, though not to the same extent as air-slaked lime. I will venture to adduce the following analogical argument in their favour. Guano, if pure, abounds with soluble neutral salts, sulphates, muriates, phosphates of ammonia, potash, and soda; its chief components in bulk consists of bones, reduced to the finest state of division, and of a varying quantity of organic matter capable of yielding ammonia. Now if those soluble neutral salts, produced in the bodies of sea-fowl by vital chemistry, are proved to be advantageous to the farm, if used with judgment and moderation, can we doubt that the carbonated salts of potash and lime, educed by the action of fire in vegetable ashes, may be used with safety and advantage wherever land is rich in decayed vegetable earth and humus? I now come to the consideration of another product of combustion—the *soot of coal.*

The analysis of soot does not appear to have been actually made; nevertheless, a sufficiently near estimate of its valuable properties may be formed. "It contains substances derived from animal matters—also sulphate and hydrochlorate of ammonia, and has been used for the preparation of the *carbonate* of that alkali. What water it yields it yields a brown bitter extract, and it contains an empyreumatic oil; but its chief basis is charcoal." So far one account, which is evidently taken from Davy's *Sixth Lecture*, (p. 278, 4th edition,) where that chemist further said, "that the charcoal, or carbon, exists in a state in which it is capable of being rendered soluble by the action of oxygen and water. This manure is well fitted to be used in the dry state, thrown into the ground with the seeds, and requires no preparation." Before I offer any remarks, it may be instructive to copy the results of a minute analysis, by Braconnot, of *wood soot*, from which a comparison can be formed.

	Per cent.
Ulmin a hydrocarbon, not well defined,	30.10
Azotised matter,	20.00
Carbonate of lime, and traces of carbonate of magnesia,	14.66
Water,	12.50
Acetate of lime,	5.65
Sulphate of lime,	5.00
Acetate of potash,	4.10
Carbonaceous matter, not soluble in alkalies,	3.85
Ferruginous phosphate of lime,	1.50
Silica,	0.95
Acetate of magnesia,	0.53
Asbolin, a peculiar acid and bitter principle,	0.50
Chloride of potassium,	0.36
Acetate of ammonia,	0.20
	100.00

A difference of opinion has prevailed concerning ulmin—a substance which is derived, it appears, from *ulmus*, the elm—and also can be obtained by digesting old garden mould in potassa liquor, subsequently precipitating the brown matter by diluted muriatic acid. It is a very doubtful product. It differs little, perhaps, from *humic acid;* and if so, the *lime test* would produce an *insoluble* precipitate. Coal soot, it will be seen, contains a much greater proportion of fine carbon, and of ammoniacal salts; which latter, I presume, consist chiefly of the *sulphate*, as coals abound in sulphur, and sulphuric acid must result from their combustion. This would combine with the ammoniacal gas, produced by the union of nitrogen and hydrogen gases, at the moment of their several developments; and thus we can account for the chemical elements detected in coal soot.

Every farmer of observation, who is experienced in the use of soot, may be acquainted with its utility as dress for most grass pastures, where, independent of its agency as a carbonous manure, it is inimical to the spread and growth of mosses; but there are some who, perhaps, are not aware of the great extent to which it has been profitably employed in Gloucestershire, not very remote from the city of Bristol, where so much coal soot is produced from the quantities of Welsh and Forest of Dean coal there consumed. Some years ago Mr John Morton, the noted author of a *Treatise on Soils*, and father to Mr John Charles Morton of Whitfield Farm, wrote an article for the *Journal of the Royal Agricultural Society*, (No. 41, vol. i. part 4, p. 388,) entitled "The mode of cultivation adopted on Stinchcombe Farm, by Mr Dimmery;" and I wish that every inquiring farmer in the United Kingdom could find an opportunity to study that excellent and most instructive condensation of judicious practice. The farm consisted of about 200 acres of arable land, and is distant from Bristol about 25 miles, and from Gloucester about 16 miles.

As it is my present object to notice exclusively the use and advantages of coal soot, I can draw but little upon the fund of

knowledge which the article comprises. Still, however, as the production of the largest crop of potatoes, at the least possible expense, was the principal object of the farm, Mr Dimmery found his adopted course of cropping, after the experience of 40 years, to be the best adapted for its attainment. Now, then, it will be made to appear that coal soot formed the basis of this entire successful course of agriculture, and, therefore, I come at once to the mode of its application, after remarking, on the authority of Mr Morton, that the soil of the upper part, next a hill, upon a terrace about 150 feet above the Severn—

Is composed of the *debris* of the oolitic rock, and is a dry gravel of little value; but that all below this, on the low terrace, is of a good friable texture, partaking of the nature of the subsoil, or lower oolite on which it rests, and is well calculated for barley and oats; it is neither too strong and adhesive for turnips and potatoes, nor too light and soft for wheat, under proper culture. The first year turnips are taken, the second year potatoes, the third and last year wheat. About one-third of the wheat stubble is sown to winter-vetches, which are eaten off the ground by sheep; and as the ground is cleared, it is prepared for a late crop of turnips, so that the whole of the land which was wheat is sown to turnips the following year. The turnips are all consumed by sheep folded on the ground. After the turnips, potatoes are planted on the whole the next year. The land is always kept in the best state of culture, and its productive power is never diminished by any of the crops which are taken.

It will be remembered that the potato disease had not commenced, as an epidemic, when Mr Morton's history of the Stinchcombe process was printed, and therefore no argument can be drawn from it of the protective power of soot; but if positive evidence be wanting, yet we learn the one great negative fact—viz. that, during a routine of 40 years, success had always resulted from Mr Dimmery's application of soot; and the mode of this application we now attempt to clearly explain.

After the sheep have consumed the turnips off a considerable part of a field, the land is ploughed to cover the manure dropped by the sheep, and left thus till March. Heavy drags, loaded with blocks of wood, and worked with six oxen, then go over the land twice to a place, traversing the whole furrowed slice: it is then rolled with a heavy roller, to bruise all the lumps brought up by the drags; after which it is again dragged in an opposite direction; and if the land works well, it will do for planting after being again rolled. The operation of planting begins about the 20th of April for the early, and the 20th of May for the late sorts, the ground being previously well pulverised and loosened to the depth it has been ploughed. (I notice these dates of planting verbatim, as experience had proved that for the previous 40 years, and to the year 1840, no epidemic disease had made its appearance.)

The ridges are a perch wide, and the drills are made across them by a heavy triangular hoe, about 4 lb. in weight, with a $2\frac{1}{2}$ feet long handle—the man moving backward, drawing the earth and the hoe with him. These drills are 22 inches asunder. Being thus formed—

A man follows with a basket of soot, and sows it in the bottom and sides of the drills with the hand, walking up the middle of the ridge, and throwing a handful of the soot, first on the right and then on the left, at the rate of about 25 bushels to the acre. The potato sets are then planted by women and boys, in the bottom of the drills, 10 inches apart; and as the seed is deposited a man follows with a hoe, about 8 inches wide, and covers the seed by drawing the earth from the space between the drills, covering the potatoes which are planted by raising the earth higher

over them than it is between them. By this mode it will be perceived that the whole of the soot does not come in contact with the seed, but is so placed as to give nourishment to the young roots.—P. 394.

The average crop may be stated at 60 sacks, of 280 lb. per acre, of good eatable potatoes, varying upwards, according to the varieties, to 70 and 80 sacks—all eatable. But these products, even at the highest, fall far short of the estimate made by the late Mr Knight of Downton, namely, of from 600 to 700 bushels, 80 lb. each, per acre. That horticulturist, however, too frequently drew averages from the yield of small plots. Few farmers have been able to obtain 20 ton crops per acre from their broad lands.

Wheat follows potatoes, according to Mr Morton, who says—

The expense of preparing the land for this crop is only once ploughing, 4 bushels of seed, (!!) and 12s. to 15s. worth of soot, (24 to 30 bushels;) so that in the system adopted on this farm, the crop of wheat—which farmers in general reckon the most valuable of all their produce, and for which all their previous course is only a preparation—really costs Mr Dimmery nothing, nor is he in any anxiety about the preparation. The crop of potatoes was his principal object, and by the mode of tillage adopted, the land was left in the best state for receiving the seed. On the subject of soot, which ultimately had become the farmer's staple manure, Mr Morton states that on this farm the quantity used was upwards of 3000 bushels a-year, one half of which is applied to the potato, and the other to the wheat crop; it is seldom that it is applied to the whole extent of either of these crops, but wherever it is thought the application would be advantageous, the expense is never saved. We have never been able to obtain from Mr Dimmery any idea *how* the soot acts in producing such effects as it evidently does both on the potato and the wheat crop. The effect is particularly evident on the wheat; for, however sickly it looks in the spring, its colour, and the vigour of its growth, are changed in a few days after the soot has been applied.—P. 399.

In 1840, analytic-cultural chemistry had effected little: ten years have witnessed some advances. The agencies of nitrogen, of the phosphates, of lime and silica, are better understood, and more minutely appreciated; but still, much is in arrear; and until the land, as a staple, be thoroughly known, the chemistry of the laboratory must be at fault.

Experiments on Dibbling Wheat, against sowing it in rows and broadcast. By Mr HAY of Whiterigg, Roxburghshire.—The statements which have at times appeared before the public regarding the great saving, as well as the greater produce to be obtained by the thin seeding of grain crops, has induced me to try whether, in the northern part of the kingdom, crops could be raised to equal those which our English brethren have been in the habit of raising by means of the dibbling machine.

Two years ago I found that as good a crop of wheat could be raised, by sowing, upon bare fallow, the small quantity of one bushel per acre, as could be raised by the more lavish expenditure of three bushels per acre, which is the usual quantity of seed sown in this neighbourhood. This year, owing to the land being not [illegible] very poor, but a wet cold clay with tilly retentive subsoil, I

was induced to sow at the rate of nearly two bushels per acre; but the land having been manured with Edinburgh manure at the rate of 14 tons per acre, the crop was much too thick; indeed so much so, that it had to be harrowed with a double turn of the heavy brake-harrows in the spring, to take out as much as possible of the superfluous plants. And notwithstanding that the crop was much too thick, it has not cut up so well as was expected, the head being small though the quality is good, and the weight per bushel 63 lb. The field was sown on the 26th of August 1849, and reaped on the 13th of August 1850; and some of it having been thrashed for seed to be sown this autumn, I am enabled to state the weight of it.

The piece of ground on which the following experiments were made was worked as bare fallow, and after being thoroughly cleaned, was ridged up. Four portions, consisting of *half an acre each*, were selected, and the same quantity of farmyard manure given to each, although in different ways.

The first portion had the manure laid upon the surface, and after being ploughed in, the ridges were again gathered up by being ribbed, so as to keep the land dry—it being undrained wet cold clay, on a retentive subsoil. The seed was then sown with the hand, and harrowed in, in the usual way, in broadcast. The number of ribs on each ridge was from 10 to 12, and the quantity of seed sown 7¾ tenths of a bushel. The expense of sowing stood thus:—

Seed, 7¾ tenths, at 8s. 9d. per bush.,	£0	6	9¼	
Time of a man and pair of horses sowing, harrowing, and water-furrowing, 4 hours, at 10s. per day, .	0	4	0	
	£0	10	9¼	= per acre, £1 1 6½

The second portion was worked and manured in every way the same as the first, but the seed was dibbled upon the top of the ribs with Newington's hand-dibble, the quantity used being 2½ tenths of a bushel. The number of ribs on each ridge was, in this case, the same as in the former. The sowing cost this:—

Seed, 2½ tenths, at 8s. 9d. per bush.,	£0	2	2¼	
Time of man dibbling, 9¼ hours, at 20d. per day, . . .	0	1	6½	
	£0	3	8¾	= per acre, £0 7 5½

The third portion was drilled the same as for turnips, the manure being put into the drills and covered with the plough, and the seed dibbled on the top of the drills with Newington's dibble, the quantity of seed used being 2 tenths of a bushel, and the number of drills seven on the ridge. The cost of sowing in this case was as follows:—

Seed, 2 tenths, at 8s. 9d. per bush.,	£0	1	9	
Time of man dibbling, 6¾ hours, at 20d.,	0	1	0¾	
	£0	2	9¾	= per acre, £0 5 7½

The fourth portion was also drilled and manured in the same way as the third portion; but after the manure had been covered in, a rut was made upon the top of the drills with the corner of the hand-hoe, and the seed sown by the hand in the rut, which was afterwards covered in by a double turn of the plough. The number of drills in this was the same as in the last case, and the quantity of seed sown was 3¾ tenths of a bushel. The sowing then cost this:—

Seed, 3¾ tenths, at 8s. 9d. per bush.,	£0	3	3¼	
Time of woman forming rut, 7 hours, at 10d., ...	0	0	7	
Time of man sowing, 5 hours, at 20d.,	0	0	10	
Time of man and and horses covering in seed, 4 hours, at 10s., .	0	4	0	
	£0	8	8¼	= per acre, £0 17 4½

The four portions were all sown upon the same day—viz., the 28th September 1849—and, with the exception of the first portion, were all reaped on the 26th of August 1850, the first portion having been reaped upon the 19th August.

From the notes I took regarding the growth, I find that, upon examining them on the 5th July, "the broadcast is the farthest advanced in ear; the rowed next; the dibbled on the ribs next; and the dibbled on the drills farthest back—evidently showing, that the thicker on the ground the earlier in ear. At present, it is my opinion that the dibbled on the ribs, taking everything into account, is the best crop."

The actual time of reaping the different kinds was seven days between the broadcast and the other three; but it would not have been nearly so much had it not been for the unfavourable state of the weather; and, in fact, the dibbled on the ribs might almost have been cut with the broadcast, had not circumstances prevented it. The dibbled on the drills was a shade later.

The different kinds were stacked upon the same day. A *quarter of an acre* of each having been measured off, the whole produce, straw and wheat, was then weighed, when it was found that the produce from the quarter of an acre was from the

			Cwt.		Tons.	Cwt.
Broadcast,	154	sheaves, weighing	20½	= per acre,	4	2
Dibbled on the ribs,	176	... ...	20¼	...	4	2
Dibbled on the drills,	167	... ...	18¾	...	3	15
Rowed on the drills,	184	... ...	19½	...	3	18

On the 11th September these sheaves were thrashed, when the results were as follows:—The broadcast gave

	11	bushels	0	tenths	of good wheat, 62 lb. per bushel,	
and	0	...	$1\frac{1}{2}$	...	of light	...
In all,	11	...	$1\frac{1}{2}$	...	equal, per acre, 5 qrs. $4\frac{8}{10}$ bushels.	

The dibbled on the ribs gave

	11	bushels	$9\frac{1}{2}$	tenths	of good wheat, 59 lb. per bushel,	
and	0	...	$2\frac{1}{2}$	...	of light	...
In all,	12	...	2	...	equal, per acre, 8 qrs. $6\frac{8}{10}$ bushels.	

The dibbled on the drills gave

	11	bushels	6	tenths	of good wheat, 62 lb. per bushel,	
and	0	...	1	...	of light	...
In all,	11	...	7	...	equal, per acre, 5 qrs. $6\frac{8}{10}$ bushels.	

The rowed on the drills gave

	10	bushels	8	tenths	of good wheat, 60 lbs. per bushel,	
and	0	...	$2\frac{1}{2}$	...	of light	...
In all,	11	...	$0\frac{1}{2}$	...	equal, per acre, 5 qrs. $4\frac{2}{10}$ bushels.	

From these results, and having been satisfied in my own mind that, by early sowing and proper management, as large a produce may be obtained from thin-seeding as by the more lavish distribution of seed, while the expense is diminished to one-third, I have again been induced to thin-seed by means of Newington's dibble, and have had two acres already put in; but considering that the ribs were too wide in the last experiment, the seed this year, 1850, was dibbled upon the top of the plough furrow after the manure was ploughed in, which has given a half more rows upon the ridge, the number in the former plan being from 10 to 12; it is now from 16 to 18. The quantity of seed sown was 1 bushel $4\frac{1}{2}$ tenths upon the two acres, and the time taken to dibble it in was 41 hours 5 minutes; so the expense was this—

1 bush. $4\frac{1}{2}$ tenths of wheat, say at 6s. per bush., ...	£0	8	8	
Time of a man, 41 hours 5 minutes, at 1s. 8d. per day, . . .	0	6	10	
	£0	15	6	= per acre, 7s. 9d.

This expense of 7s. 9d. per acre is just about the same as that of dibbling on the ribs last year, but it will be observed that the wheat is charged less this year than it was last. The price then was what it actually cost me, and now it is charged at about the market value for good seed. Of course, the cheaper the seed can be purchased, the less will the cost of sowing be, as the seed is the most expensive part of the process; but in the above experiments, the seed and labour being charged alike in all, the relative expenses are correctly given. It may be observed, however, that the broadcast seeding was thin, being about half the usual quantity sown in

this part of the country, the quantity used being only 1 bushel 5½ tenths per acre. The seed sown this year was two years old, and the same as that sown last year, and it is already brairded,—16th September.

I trust that others will be induced to try the thin-seeding; for should it be generally proved that half the seed commonly sown will produce an equally good crop, a great saving might be effected to the agriculturists throughout the kingdom in that particular alone, and assuredly these are not the times for practising any sort of wastefulness.

Notes on American Agriculture.—(Continued from p. 418.) The grasshoppers are the largest we ever saw, and in some seasons are found in amazing numbers. On a warm sunny day the noise they make is truly astonishing. At a certain stage of their existence they are furnished with wings of a beautifully variegated colour; but they cannot fly far without alighting. They are, however, difficult to catch: in seeing one with peculiarly gorgeous wings, we have often chased, but as often failed to catch it. On one occasion the writer, after a vigorous chase, pounced upon one. It measured *one inch and a quarter* in length. "They eat anything," said a Yankee farmer to the writer; "at least a parcel of them ate my coat all but the buttons, which I was foolish enough to leave on the ground." This, doubtless, was somewhat exaggerated; but we have been witness to their voracity. The insects called "cicadas," which live upon trees, and emit such a peculiar sound, are very numerous: some species of them utter a sound exactly resembling "Katie did," while others as exactly answer "Katie didn't." At dusk, and till sunrise, all the woods and fields are animated. The first evening at an American farm in the interior will not soon be forgotten, we take it, by those who have enjoyed the privilege of a visit thereto. Ours haunts our memory yet. The night was a lovely one, the sky clear and bright, and the stars shining—and they do shine there in such a way as is never seen here—they actually reflect and sparkle in the waters. The fire-flies were dancing gaily, flashing here and there like so many tiny fairy lamps: the frogs croaking, some whistling, and that not badly, but clear and full—for some species add this to their other accomplishments; the cicadas chirrupping lustily, and the never-failing asseveration, "Katie did," and its equally certain answer that "Katie didn't," filled the air with a multitude of sounds by no means unpleasing, but certainly of a strangely odd character, most curious to European ears, accustomed to the still quietness of an English summer eve. The variety of not unmusical noises thus maintained for many hours every evening, is called the "Yankee band;" and certainly the musicians are untiring in their efforts.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON

Date.	Wheat s. d.	Barley. s. d.	Oats. s. d.	Rye. s. d.	Pease. s. d.	Beans. s. d.
1850						
June 1	43 1	25 1	17 7	23 0	29 9	26 3
8	42 11	26 4	19 3	25 8	27 11	23 0
15.	44 3	25 9	17 6	23 6	28 10	26 7
22	43 4	24 4	18 2	22 6	26 4	26 0
29.	44 8	25 0	18 6	22 0	26 3	27 4
July 6.	43 7	23 7	19 8	23 4	30 0	26 6
13.	43 6	24 2	17 0	24 0	25 6	25 0
20.	45 1	24 3	20 0	23 6	26 4	26 5
27	46 7	24 4	19 5	23 0	27 0	25 11
Aug. 3.	47 3	21 8	18 6	23 0	27 6	26 0
10.	47 8	24 10	17 10	23 8	25 2	25 6
17	44 11	23 6	19 3	23 6	25 9	26 7
24.	46 10	23 1	20 6	24 0	23 1	27 10
31	46 11	23 6	19 1	24 9	28 0	26 11

EDINBURGH.

Date.	Wheat. s. d.	Barley. s. d.	Oats. s. d.	Pease. s. d.	Beans. s. d.
1850.					
June 5.	39 6	23 6	21 2	29 6	30 4
12	40 1	22 0	21 1	30 0	30 9
19.	39 11	21 10	20 3	29 6	29 11
26.	41 0	21 11	19 11	28 0	28 4
July 3.	39 11	23 9	20 3	28 6	29 3
10.	41 8	23 3	21 7	28 4	28 10
17.	41 10	21 9	21 11	29 0	29 7
24.	41 8	21 8	21 7	27 0	27 6
31.	42 3	23 1	21 9	28 4	29 1
Aug. 7.	41 9	21 8	21 5	27 2	27 10
14.	41 6	21 4	21 2	27 6	28 2
21.	42 1	23 9	20 10	29 9	29 10
28.	41 11	22 10	21 10	30 6	32 0

LIVERPOOL.

Date.	Wheat s. d.	Barley. s. d.	Oats. s. d.	Rye. s. d.	Pease. s. d.	Beans. s. d.
1850.						
June 1	40 1	21 2	15 9	21 2	25 3	28 4
8	39 8	18 0	17 5	21 9	25 6	27 4
15	41 4	19 8	21 2	22 4	26 0	28 6
22	39 10	20 4	18 0	22 8	26 4	28 7
29	42 1	21 2	20 0	21 10	27 1	27 6
July 6	42 4	22 0	20 7	22 8	28 0	27 4
13	41 4	21 8	17 8	23 4	27 0	27 3
20	42 0	21 2	16 5	22 0	26 8	29 1
27	44 3	21 6	20 4	32 4	27 2	28 1
Aug. 3.	42 4	22 1	24 4	22 8	27 6	29 6
10.	42 3	22 4	18 5	22 2	27 0	27 10
17	39 8	23 6	16 10	23 1	26 10	28 6
24	41 2	21 10	17 0	22 4	27 3	28 4
31	43 2	23 2	16 7	22 10	26 10	28 10

DUBLIN.

Date.	Wheat, p. barl. 20 st. s. d.	Barley, p. barl. 16 st. s. d.	Bere, p. barl. 17 st. s. d.	Oats, p. barl. 14 st. s. d.	Flour, p. barl. 2 st. s. d.
1850.					
June 7.	22 6	11 4	10 4	11 3	14 9
14.	22 9	11 2	10 2	11 1	14 6
21.	23 0	11 3	10 1	11 3	14 3
28.	21 1	11 1	10 0	11 6	14 0
July 5.	21 2	10 10	10 3	11 3	14 3
12.	23 6	11 6	10 2	11 2	14 6
19.	23 3	11 4	10 0	11 3	14 6
26.	24 10	11 6	8 7	11 3	14 4
Aug. 2.	24 6	11 9	8 10	11 0	14 2
9.	23 6	11 10	9 2	10 3	14 4
16.	22 8	11 6	8 7	10 6	14 9
23.	22 10	11 7	8 9	10 0	14 8
30.	22 9	10 6	8 10	9 3	14 6

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average. s. d.	Wheat. Aggregate Average. s. d.	Barley. Weekly Average. s. d.	Barley. Aggregate Average. s. d.	Oats. Weekly Average. s. d.	Oats. Aggregate Average. s. d.	Rye. Weekly Average. s. d.	Rye. Aggregate Average. s. d.	Pease. Weekly Average. s. d.	Pease. Aggregate Average. s. d.	Beans. Weekly Average. s. d.	Beans. Aggregate Average. s. d.
1850.												
June 1	40 2	38 9	23 0	23 5	15 11	15 6	22 0	21 1	26 2	25 2	26 11	25 2
8.	39 8	39 2	22 4	23 5	16 7	15 8	23 7	21 6	26 8	25 6	27 0	25 2
15.	39 1	39 8	21 9	22 6	16 11	16 1	22 8	21 11	27 3	25 10	26 10	25 3
22.	40 5	40 0	23 8	22 6	16 10	16 4	22 6	22 5	26 9	26 2	26 7	26 6
29.	40 9	40 3	21 6	22 4	16 5	16 6	21 6	22 5	26 11	26 6	26 11	26 7
July 6.	40 11	40 4	21 9	22 3	17 0	16 7	23 2	22 7	28 4	27 0	26 10	26 10
13.	41 3	40 6	21 5	21 11	16 11	16 9	23 3	22 10	26 6	27 1	27 2	26 11
20.	42 4	40 11	22 3	21 11	17 9	17 0	22 7	22 7	27 11	27 3	27 5	27 0
27.	43 6	41 6	22 4	22 0	18 1	17 3	24 0	23 0	27 2	27 4	27 4	27 1
Aug. 3.	43 7	42 1	22 4	21 11	18 2	17 4	22 2	22 11	27 8	27 6	27 8	27 3
10.	44 1	42 7	22 5	22 1	17 11	17 7	23 8	23 3	26 10	27 7	27 9	27 4
17	43 8	43 1	22 8	22 2	18 4	18 0	23 0	23 4	26 5	27 2	28 2	27 7
24.	43 6	43 5	23 0	22 6	17 9	18 0	20 10	23 10	26 3	27 3	28 1	27 9
31.	43 6	43 7	22 4	22 7	17 9	18 1	22 4	22 11	26 11	27 0	28 11	28 0

FOREIGN MARKETS.—Per Imperial Quarter, Free on Board.

Date.	Markets.	Wheat	Barley.	Oats.	Rye.	Pease.	Beans.
1850.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June ..	Danzig	32 6 - 41 0	10 6 - 13 6	9 0 - 12 6	15 6 - 19 0	18 0 - 21 0	18 0 - 22 [illegible]
July ..	Danzig	37 6 - 46 0	12 0 - 15 6	10 0 - 14 0	16 0 - 20 0	19 6 - 22 6	18 6 - 24 [illegible]
Aug. .	Danzig	36 0 - 43 0	14 0 - 17 0	9 6 - 13 6	16 6 - 21 0	18 6 - 23 0	19 0 - 25 [illegible]
June ..	Hamburg	30 6 - 40 0	16 6 - 23 0	12 0 - 16 0	15 6 - 22 0	16 6 - 23 6	16 0 - 21 [illegible]
July ..	Hamburg	32 6 - 42 6	18 0 - 22 6	12 6 - 16 6	16 0 - 24 0	18 6 - 25 0	16 6 - 23 [illegible]
Aug. .	Hamburg	31 6 - 40 0	16 0 - 20 0	11 0 - 15 0	15 0 - 22 6	16 0 - 26 6	16 6 - 23 [illegible]
June ..	Stettin	32 0 - 40 0	12 0 - 16 0	9 0 - 13 0	15 6 - 21 0	18 0 - 22 0	18 6 - 23 [illegible]
July .	Stettin	32 6 - 39 6	12 6 - 16 6	9 6 - 13 6	16 6 - 23 0	19 6 - 23 6	20 0 - 25 [illegible]
Aug. ..	Stettin	36 6 - 43 0	13 0 - 17 6	9 0 - 13 0	16 0 - 22 6	20 0 - 24 0	22 0 - 27 [illegible]
June	Königsberg	33 6 - 40 0	10 6 - 14 6	8 6 - 11 6	16 0 - 20 0	17 6 - 20 0	16 6 - 19 [illegible]
July ..	Königsberg	34 0 - 42 6	12 0 - 16 6	9 0 - 12 0	14 6 - 18 0	18 0 - 21 0	17 6 - 20 [illegible]
Aug. ..	Königsberg	32 6 - 41 0	12 0 - 15 6	8 [illegible] - 11 0	14 0 - 18 6	19 6 - 24 0	15 6 - 23 [illegible]

Freights from the Baltic from 2s. 3d to 3s. 2d, and from the Mediterranean, from 5s. 6d to 7s. 6d.

THE REVENUE.—From 5th July 1849 to 5th July 1850.

	Quarters ending July 5. 1849.	Quarters ending July 5. 1850.	Increase.	Decrease.	Years ending July 5. 1849.	Years ending July 5. 1850.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs ...	4,128,777	4,333,708	204,931	..	18,810,774	18,740,194	..	70,580
Excise.	3,220,602	3,325,225	304,623	..	12,196,913	13,097,336	900,423	..
Stamps	1,619,697	1,590,767		28,930	6,103,408	6,325,499	222,091	..
Taxes	2,054,730	2,073,281	18,551	..	4,339,500	4,351,530	12,030	..
Post Office .	196,000	210,000	14,000	..	849,000	817,000	..	32,000
Miscellaneous	110,140	121,474	11,334	..	334,564	369,744	35,180	..
Income Tax	1,033,240	1,026,835		6,405	5,362,083	5,459,843	97,760	..
Total Income	12,363,186	12,881,290	553,439	35,335	47,996,242	49,161,146	1,267,484	102,580
	Deduct Decrease .		35,335		Deduct Decrease		102,580	
	Increase on the qr.		518,104		Increase on the year		1,164,904	

TABLES OF BUTCHER MEAT.—Per Stone of 14 Pounds.

Date.	LONDON Beef.	LONDON Mutton	LIVERPOOL Beef.	LIVERPOOL Mutton.	NEWCASTLE. Beef.	NEWCASTLE. Mutton.	EDINBURGH. Beef.	EDINBURGH. Mutton.	GLASGOW. Beef.	GLASGOW. Mutton.
1850.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
June ..	5 0 - 6 6	5 6 - 6 9	4 9 - 6 3	5 0 - 6 6	4 9 - 6 3	4 6 - 6 3	5 3 - 6 3	5 3 - 6 6	5 6 - 6 6	5 3 - 6 [illegible]
July ..	4 9 - 6 9	5 9 - 7 3	4 6 - 6 0	4 9 - 6 3	5 0 - 6 3	4 9 - 6 6	5 6 - 6 6	5 6 - 6 9	5 9 - 6 9	5 6 - 6 [illegible]
Aug. ..	4 9 - 6 9	5 9 - 7 0	4 9 - 6 3	5 0 - 6 6	4 9 - 6 3	4 6 - 6 3	5 3 - 6 3	5 3 - 6 6	5 3 - 6 9	5 6 - 6 [illegible]

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

ENGLISH.	s. d. s. d.	SCOTCH.	s. d. s. d.
Merino, ..	12 0 to 17 0	Leicester Hogg, ...	10 0 to 16 0
.. in grease, ...	9 6 to 13 6	Ewe and Hogg, ...	8 6 to 12 6
South-Down, ...	12 6 to 17 6	Cheviot, white, ...	11 6 to 16 0
Half-Bred, ...	10 0 to 13 0	.. Laid, washed, ...	8 9 to 11 9
Leicester Hogg, ...	10 0 to 16 0	.. unwashed, ...	6 6 to 8 6
.. Ewe and Hogg, ...	9 0 to 13 0	Moor, white, ...	6 6 to 7 6
Locks, ...	6 3 to 8 6	.. Laid, washed, ...	6 0 to 7 0
Hose, ...	5 6 to 7 3	.. unwashed, ...	5 6 to 6 6

LEGISLATIVE MEASURES OF THE SESSION OF 1850, RELATIVE TO AGRICULTURAL AFFAIRS AND RURAL IMPROVEMENT.

The following is an analysis of the various acts, public and local, passed in the last session of parliament, relating to agricultural and rural affairs:—

DRAINAGE ACTS.

Two acts were passed connected with this branch of agricultural improvement—one, a public act applicable to the United Kingdom; the other, a local act, referring to the county of Huntingdon.

Drainage and Improvement of Land Advances Act.—The public act (cap. 31) is entitled "An Act to authorise further advances of money for drainage and the improvement of landed property in the United Kingdom, and to amend the acts relating to such advances." After reciting the titles of sundry acts passed in the sessions of 1846–7–8–9, the preamble clause proceeds to enact that the Treasury Commissioners shall be empowered to advance out of the consolidated fund a sum not exceeding £2,000,000 as loans for the improvement of landed property in Great Britain, and a sum not exceeding £200,000 as loans for a like purpose in Ireland. The sums to be advanced for Great Britain to be applied to loans under the act passed in 1846, (cap. 101,) and the subsequent acts amending the same; and those to be advanced for Ireland under the act passed in 1847, (cap. 32,) and the amending act. The 4th clause empowers the Enclosure Commissioners for England and Wales to sanction, where they think fit, the application of advances to "other works" than those mentioned in the provisional certificate. The amount of loans to the same owner in Great Britain to be restricted to £5000; a subsequent clause enacts a similar limitation to landowners in Ireland. The owner of lands in England or Wales, who may be labouring under mental disease or any other legal disability, may be represented, for the purposes of this act, by his guardian or trustee. Loans may be made "for the erection of farm-buildings in Ireland." The next clause refers to the time for the completion of works in Ireland; and after repealing the clause in a former act which limited the period to "three years," it empowers the Commissioners of Public Works in Ireland to extend the period to "five" years from the date of the first advance. By the 11th clause, the Treasury Commissioners are authorised to advance a sum not exceeding £800,000, as may from time to time be required, for "the extension and promotion of drainage and other works of public utility in Ireland." The two concluding clauses extend the provisions of existing acts (previously cited) to this act.

Ramsey, Upwood, and Great Raveley Drainage Act.—This act (cap. 12) is entitled "An Act for the more effectual drainage and

improvement of certain lands in the parishes of Ramsey, Upwood, and Great Raveley, all in the county of Huntingdon." The districts or lands in the first-named parish are described in the preamble clause as those called Ramsey Turf Fen or Ramsey Lotting Fen, and Lockspit Lots and Lockspit Common; those in the second parish called Upwood Turf Fen or Upwood Turf Crofts; and those in the third parish called Great Raveley Turf Crofts or Great Raveley Turf Fen. These several lands are represented as being deficient in drainage and liable to be flooded, and without any defined or sufficient means of access to the greater part of them; hence the great improvement, it is alleged, that would ensue if proper works were executed and means provided for the drainage of the same. To accomplish this object is the intention of the present act; among the leading provisions of which are the following:—The possession of not less than eight acres of the lands subject to be taxed by virtue of this act, to be the qualification for a commissioner; if possessed of twenty-eight acres, he may appoint a deputy to act in his absence; and if possessed of forty-eight acres, he may appoint a deputy for every additional twenty acres beyond the first twenty-eight. The first general meeting to be held within three months after the passing of this act, (May 17, 1850,) at the Crown Inn, in Ramsey, and also two general meetings on the second Thursdays in the months of April and October in each year, at such places as the commissioners shall appoint. All the business of the commissioners may be transacted at the general or adjourned meetings; the quorum of a meeting to be three. The "Lands Clauses Consolidation Act, 1845," to be incorporated with this act. The period for compulsory purchase of lands to be limited to three years from the passing of this act, and ten years to be the prescribed period for the sale of superfluous lands. The following clause refers to the works to be executed by the commissioners:—

They may make, erect, repair, and maintain all such sluices, ditches, doors, cuts, catchwater drains and other drains, tunnels, dams, headings, outlets, forelands, stanches, culverts, banks, and steam-engines, mills, or other engines, bridges, machinery, buildings, and other works and conveniences, as they may deem requisite for the drainage and improvement of the lands within the limits of this act or any part thereof, and may also connect any such cuts or catchwater drains with any cuts or catchwater drains in any adjoining district or lands, and may also connect any such banks with any banks in any adjoining district or lands:

They may cleanse, scour, deepen, and improve or alter the course of any existing banks, ditches, drains, or water-courses within the limits of this act:

They may enter upon, take, and use any lands, public drains and other drains, banks, or hereditaments within the limits of this act, and may dig and take earth and soil therefrom, or may lay up and continue earth and soil or other matters thereon, and may remove trees and other obstructions within the limits of this act:

They may make, or cause to be made, all such surveys of the lands, works, and hereditaments within the limits of this act as they may think fit:

They may lay out, construct, repair, and maintain all such droves or occupation roads, with proper banks, ditches, or other fences, as they may think requisite for the convenient use and occupation of any lands within the limits of this act:

Provided always, that no such droves, roads, or other works as last aforesaid,

shall be made for the benefit of any lands in either of the districts called Lockspit Common, Upwood Turf Fen or Upwood Turf Crofts, and Great Raveley Turf Crofts or Great Raveley Turf Fen, as herein-before defined, unless and until the lands within those districts shall become liable to the road rate as herein-after mentioned.

Cuts are not to exceed eleven feet in width at the bottom. Commissioners are empowered to lease the herbage growing upon any of the occupation-roads or drove-ways, and may also make a drain from the south-west corner of Ugg Mere Cote Drove, next Upwood Common, to the drain called Raveley Drain; the expenses of which to be defrayed by the trustees under the will of the late William Coulson, and by William Nix, Beasley Summers, and John Julian. Money may be borrowed, on mortgage of the general drainage rate, not exceeding £3000; on security of the road rate, not exceeding £1000; and on mortgage of the additional rate, when any shall arise, not exceeding £1000. No sinking fund to be required for paying off borrowed monies. Lands are not to be rated higher than ten shillings per acre under the general drainage rate or the road rate, nor higher than five shillings per acre under the additional rate. Lands not rated to the rates made by the commissioners of the Eau Brink Drainage and Navigation, to be exempted. Rates may be retrospective or prospective. Occupiers of lands may deduct the rates paid by them from their rents; but no beneficial lessee to be allowed to do so where five years of the lease are unexpired. Owners of unoccupied property to be rated. Lands may be let or sold for payment of taxes. The rate upon land dug out, or otherwise rendered unfit for occupation, to be recoverable of the owner of such land. Lands taken by the commissioners to continue liable to the middle level tax. Persons having a limited interest may raise money by mortgage on lands for the payment of rates levied for the construction of any works authorised by this act, but not for maintaining or repairing the same. All monies arising from rates, taxes, or mortgages, to be applied as follows:—Firstly, in payment of the costs of obtaining this act; secondly, in payment of the interest of monies borrowed; thirdly, in defraying the expenses of executing the works authorised by this act; and, fourthly, in paying off all principal sums borrowed on the credit of the rates. The three subsequent clauses refer to the saving rights of the Middle Level Drainage Commissioners, the Bedford Level Commissioners, and the lords of the manors of Ramsey, Upwood, and Great Raveley. Several clauses refer to penalties for divers enumerated offences, such as using a drain without license, encroachments, non-payment of rate, &c., the proceeds of which are to be paid over to the commissioners, and applied by them for the purposes of this act. In citing this act in legal instruments, it will be sufficient to use the expression "The Ramsey, Upwood, and Great Raveley Drainage Act, 1850."

ACTS OF ENCLOSURE.

Annual Enclosure Act.—Two acts of enclosure were passed last

session, the first of which (cap. 8) is entitled "**An Act to authorise the enclosure of certain lands in pursuance of the 'Fifth Annual General Report' of the Enclosure Commissioners of England and Wales, and to confirm the proceedings in the matter of the Common Wood Enclosure.**" The lands are specified in a schedule annexed to the act, and are situated in the following counties:—**Bucks**: Little Missenden; Penn. Carnarvon: Caerhyn; Llanbedr y-cenin. Devon: Bolham Hill; Churchstanton. Derby: Dalbury Lees Green. Gloucester: Weston Subedge. Hereford: Swinmore Common. Monmouth: Caldicot-cum-Newton. Norfolk: South Woolton. Northumberland: Alnwick Moor. Nottingham: Sherwood Forest, part of, in Mansfield. Surrey: Tilford; Carshalton and Wallington; Caterham. Somerset: Kewstoke. Sussex: Nutbourne Common; Storrington. Westmoreland: Dillicar Common. York: Bewerley Moor and Hardcastle Moor. The proceedings relative to the enclosure of Common Wood, in the parish of Holt, in the county of Denbigh—which were confirmed by the commissioners on the 16th of November 1848, and a part of the lands subsequently sold by the valuer—have suggested doubts whether the land, the subject-matter of the enclosure, were "a stinted pasture, or lands subject to rights of common which might be exercised at all times of every year, for cattle levant and couchant upon other land; and whether, as such, the said enclosure should not have received the previous authority of parliament." The clause in this act settles the doubt by confirming all the proceedings of the commissioners in reference to their awards, &c., and declaring the holders of such lands to have the same title to them as if the said enclosure had received the previous authority of parliament. The concluding clause notifies that in citing this act in legal instruments, it will be sufficient to use the expression, "The Annual Enclosure Act, 1850."

Second Annual Enclosure Act.—This act (cap. 66) is entitled "An Act to authorise the enclosure of certain lands in pursuance of a 'Special Report' of the Enclosure Commissioners for England and Wales. These lands and their localities are thus specified in a schedule annexed to the act:—Bucks: Hitchenden. Cambridge: Mepal. Cardigan: Nantcwulle. Carmarthen: Llanycrwys; Pen-arreg. Cumberland: Talkin Fell. Flint: Picton Marsh. Norfolk: Runhall Commons; Salthouse and Kelling; Litcham. Northumberland: Warkworth. Oxford: Shipton-under-Wychwood; Southstoke-cum-Woodcote. Salop: Little Drayton Heath. Suffolk: Wattesfield; Haughley. Stafford: Coven. Surrey: Farnham Manor. Westmoreland: Over Staveley; Little Musgrave. York: Bainbridge; Burn Common; Fountains Earth Moor; Garsdale. In citing this act in legal instruments, it will be sufficient to use the expression, "The Second Annual Enclosure Act, 1850."

[illegible]HOLD LANDS.

[illegible] Amendment.—In the session of 1849, it

will be remembered, an act was passed for "granting relief against defects in leases made under powers of leasing in certain cases."* The operation of the measure was, however, by a short act subsequently passed in the same session, suspended until the 1st of June 1850; prior to which (May 31, 1850) another act (cap. 17) received the royal assent, to "amend" the act of 1849 by "repealing" so much of the former act as enacts that "the acceptance of rent under any such invalid lease as therein-mentioned shall, as against the person accepting the same, be deemed a confirmation of such lease." The second clause of the amended act then enacts—

That where, upon or before the acceptance of rent under any such invalid lease, as in the said first-recited act mentioned, any receipt, memorandum, or note in writing, confirming such lease, is signed by the person accepting such rent, or some other person by him thereunto lawfully authorised, such acceptance shall, as against the person so accepting such rent, be deemed a confirmation of such lease.

The third and concluding clause enacts that where, during the continuance of the possession taken under an invalid lease, the reversioner is able and willing to confirm such lease without variation, the lessee shall, upon being requested so to do by the former, be bound to accept a confirmation accordingly, such confirmation to be by memorandum or note in writing, signed by the persons confirming and accepting respectively.

MARKETS, SLAUGHTER-HOUSES, &C. (SCOTLAND.)

Two acts for the improvement of markets, and the removal of existing, and the erection of new public slaughter-houses in Scotland, were passed last session, referring respectively to the cities of Edinburgh and Glasgow. The first, which received the royal assent on the 15th of July last, is entitled,

The Edinburgh Slaughter-Houses Act.—On the 4th of August 1621, was passed an act of the Parliament of Scotland for the correction of certain abuses which then prevailed in the city of Edinburgh, occasioned by the butchers or fleshers keeping their slaughter-houses within the city, and emptying the refuse arising therefrom upon the high streets; whence it was enacted by the said act, that from and after the 1st of May in the ensuing year, all fleshers should provide themselves with slaughter-houses at the North Loch side, "where they might have the use of water for their business." For upwards of a century and a half no further legislative interference was deemed necessary. At the end of that period, however, the city of Edinburgh, in common with other leading towns, had become so greatly extended in its buildings and population, that the slaughter-houses which had been removed to the North Loch side, as a remote locality, now stood "almost in the centre of the said city;" and the large body of water, at one time so convenient for the business of the fleshers, had been drained, thereby again rendering the slaughter-houses a public nuisance, and of

* Vide *Journal of Agriculture* for January 1850, p. 192.

course greatly detrimental to the health and comfor bitants in that part of the city. Hence the expe more resorting to parliament for fresh powers; acco act passed in the 22d of Geo. III. (cap. 52,) "for p slaughtering of cattle within the city of Edinburgh, a ing nuisances and annoyances therefrom," it was en ground that fleshers and other persons would be accommodated with water and other conveniences their business "if the same were removed to some p sea-shore, or on the sides of some of the rivers and vicinity of the said city"—that from and after the 1783, no butcher, flesher, or other person should k &c., any beast, swine, calf, &c., within the city of E royalty thereof, or within three quarters of a mile, t from the Tron Church in the said city, or within a mile on either side of the river of Leith, situate bridge of Leith and Canonmill Bridge. The re slaughter-houses contemplated by this second act w ever, carried into effect; on the contrary, it appea subsequently enlarged, and became and continued to slaughter-houses of the said city, until a recent per area thereof was acquired by the Edinburgh and Gla Company," and then it was that the slaughter-houses The inconvenience consequent upon this, and the pro are thus referred to in the concluding sentences of clause of the act (cap. 70) passed last session, whi "An Act to provide for the erection of public sla for the city of Edinburgh, and for the regulation of

And whereas the fleshers of the said city have come to be subject venience from the want of suitable public slaughter-houses, and it only with regard to their convenience, but also to the promotion c comfort of the population of the said city and of the adjoining dist increased, that such shall be provided: And whereas it has been the magistrates and council of the said city, and a numerous bo therein, that such public slaughter-houses shall be provided by th and council, under proper and sufficient conditions and regulatio carrying out of the said scheme.

The act then proceeds to state, that it shall be magistrates and council, as soon as conveniently ma passing of this act, and with the advice and con Plummer, William Carmichael, Thomas M'Millan, G George M'Millan, James Gravett, and James Caldw Edinburgh, or the major part of them, or of the surv to purchase one or more pieces of land of sufficient ex within the bounds of police of the said city, to be a the erection thereon of slaughter-houses; a plan sho line of such land, and its relative situation to the a to be exhibited for public inspection in the town-cle fourteen days after a newspaper notification. The m council to erect and maintain the necessary slaught

from time to time to improve, extend, and enlarge the same as circumstances may require; but before proceeding to do so, a plan, elevation, specification, and estimate of the probable expense of completing the same, to be also exhibited for public inspection at the town-clerk's office for fourteen days. The regulation and superintendence of the slaughter-houses to be vested in the magistrates and council, who may make rules, bye-laws, &c. All regulations, whether relating to the markets of the city or to the slaughter-houses, to be conspicuously exhibited for the information of the public. Persons having unwholesome meat in their possession to be liable to a penalty not exceeding £20; and any person having in his booth, or in his possession in any place within the slaughter-houses, any blown or stuffed veal, lamb, or other butcher's meat, to be liable to a penalty not exceeding £5. The superintendent may enter and inspect slaughter-houses and seize unwholesome meat. The requisite capital for defraying the expense of erecting the slaughter-houses, to be provided by the magistrates and council, who are empowered to charge against the revenues of the slaughter-houses a permanent annuity at the rate of £7, 10s. for every £100 of the capital required; such annuity to be chargeable half-yearly, on the 1st of February and 1st of August: the annuity to be applied in payment of the interest on the sums advanced by the magistrates and council; the surplus to be applied to the repayment of the sums advanced or borrowed, until the same shall be wholly paid, when the permanent annuity is to be reduced to £5 for every £100 of the capital sum; the same to be carried to the credit of the municipal revenues of the city. The amount of the capital sum is limited to £20,000, which may be borrowed by the magistrates and council as they shall see fit, on security of the land and buildings to be erected. The 19th clause relates to the allocation and rent of separate booths in the slaughter-houses, and is as follows:—

And be it enacted, that it shall be lawful to the magistrates and council, by their tacksmen or collectors, to levy, collect, receive, and take from every flesher to whom a separate booth in the said slaughter-houses shall be allocated as after mentioned, over and above the dues after mentioned on cattle slaughtered therein, a yearly rent of £8 for each booth, payable by equal portions, half-yearly, at Whitsunday and Martinmas, in advance; in consideration of which rent there shall be allocated to each flesher who shall pay the same, a separate booth, to be used by him as his own place of business, but which he shall not be at liberty to subset: Provided always, that a proportion of the said yearly rent shall be exigible corresponding to the period from the entry to such booth to the first term of Whitsunday or Martinmas thereafter, and that it shall be lawful to allocate a booth for the joint use of two fleshers, each of whom shall in such case pay one-half only of the aforesaid rent: Provided also that, subject to the rules, regulations, orders, and bye-laws to be made as aforesaid, a limited number of such booths shall be fitted up with the requisite apparatus, and allotted for the use in common of fleshers who may only occasionally resort to the said slaughter-houses, or who kill only a limited number of cattle, and whom, on one or other of these accounts, the magistrates and council may not require to rent a booth separately, or jointly with another, as aforesaid; in regard to which the magistrates and council shall be the sole judges, and which fleshers shall not be chargeable with rent as aforesaid.

The next clause refers to the dues to be levied on all cattle brought to the slaughter-houses to be slaughtered, (as set forth in an appended schedule,) and are as follows:—If brought by a flesher renting a booth—on each bull, segg, ox, cow, or heifer, 6d.; on each sow, hog, boar, or pig, 3d.; calf, 3d.; sheep or lamb, 1d.; stag or deer, 3d.; and, if brought by a flesher not renting a booth, then double the above dues. An account to be kept in the books of the city chamberlain of the revenues derived from the slaughter-houses, including all incidental revenue and sums received for the refuse, which shall be the property of the corporation—the same to be employed in defraying the necessary expenses of collection, management, repairs, &c.; such accounts to be open to inspection, and an abstract of them to be published and deposited with the superintendent of the slaughter-houses for delivery to each person slaughtering cattle, on payment of one penny. And with the view of determining whether the said dues shall be continued, increased, or diminished, a periodical investigation of accounts is to take place—the first investigation to be on the 1st of August that shall happen after the slaughter-houses have been opened for twelve months, and subsequently on the 1st of August in every third year, in the manner specified at length in the twenty-third clause. In the event of any difference arising between the magistrates and council and the fleshers, as to the annual accounts, dues, &c., the same is to be referred, by summary petition, (within three months after the publication of the accounts,) to the sheriff, whose decision shall be final. Slaughtering of cattle within the bounds of police of the city, or within one mile beyond such bounds, otherwise than within the slaughter-houses, to be prohibited after three months' notice of the completion of the erections; parties infracting, to be liable to a penalty not exceeding £5 for every offence. Slaughter-houses established by the commissioners of police of Leith, to be excepted from the operation of this act, provided no portion of the carcass of any cattle be brought within the bounds of police of Edinburgh for sale, in which case the same dues are to be chargeable as are leviable under a previous clause; the like power to extend to any other persons who may attempt to evade the use of slaughter-houses by introducing meat slaughtered beyond the prescribed bounds. No hides, skin, or tallow of cattle, not slaughtered in the slaughter-houses of the city, to be exposed for sale without the consent of the magistrates and council. Certain provisions of the "Edinburgh Police Act, 1848," (detailed at length in the 30th clause,) in so far as the slaughter-houses to be erected by virtue of this act are concerned, to be repealed. This act not to affect the customs leviable on live bestial under the act 7th and 8th Vict. c. 7. Offenders violating the provisions of this, or the three other existing acts (viz., 3d and 4th Vict. c. 17; 7th and 8th Vict. c. 7; and 10th and 11th Vict. c. 48,) and not paying penalties incurred, may be imprisoned for not more than

twenty-one days where the penalty does not exceed forty shillings, nor for more than sixty days when the penalty exceeds that amount; all complaints to be made within six months after the commission of an offence. The concluding clause enacts that the expenses of obtaining this act shall be paid by the magistrates and council; in the first instance, "out of the first and readiest of the municipal revenues of the city, and eventually out of the monies which may be raised by virtue of this act." In citing this act in legal instruments, it will be sufficient to use the expression, "The Edinburgh Slaughter-houses Act, 1850."

The Glasgow Market and Slaughter-houses Act.—This act, (cap. 101,) which received the royal assent on the 14th of August last, was passed to authorise "the extension and better regulation and management of the markets and slaughter-houses in the city of Glasgow." The preamble clause commences by referring to three previous statutes; one passed in the first year of the reign of Geo. IV., for amending two acts of Geo. III., relating to the conversion of the statute labour within the royalty of Glasgow, and to the sale of live cattle and opening certain streets, &c. in the said city; another, passed in the 6th of Geo. IV., for establishing additional market-places, and otherwise improving the city of Glasgow; and the third, passed in the 8th and 9th Vict., for the better regulation and management, and for the extension of the slaughter-houses and market accommodation in the same city. The clause then proceeds to detail the objects for which the act of last session was passed, as follows:—

And whereas the magistrates and council of the said city, as trustees under and for the execution of the said recited acts have, at very considerable expense, erected and established within the said city, markets and market-places for the sale of live cattle, for the sale of horses, and for the sale of butchers' meat, and also slaughter-houses, which are a great public benefit and accommodation to the community: and whereas by contract and deed of agreement between the said magistrates and council, trustees as aforesaid, and the incorporation of fleshers of Glasgow, dated the 16th and 29th of November 1849, the said incorporation, for the considerations therein specified, renounced and surrendered the right and privilege reserved to them by the said last-recited act of having fifteen stalls or standing places in the existing markets set apart and allocated to certain members of the said incorporation: and whereas, from the great increase of the city, and in order to promote the health, comfort, and accommodation of the inhabitants, it is necessary that certain of the existing market-places and slaughter-houses should be improved, and that additional market-places and slaughter-houses should be erected and established: and whereas it is expedient that the said recited acts, in so far as they relate to markets and slaughter-houses, should, subject to the provisions herein-after contained, be repealed, and that new and enlarged provisions should be made for carrying out the purposes above mentioned, and for the maintenance and regulation of such markets and slaughter-houses, and that such provisions should be extended and applied to the whole lands and territory within the parliamentary and municipal limits and boundaries of the city and royal borough of Glasgow, including the burgh of Calton, and village and lands of Mile End, and the burgh of Anderston, and other territory, which were excluded from the provisions of the said last-recited act.

It is then enacted, that the first and second recited acts, "in so far as the same relate to the said markets and market places," as well as the last-recited act, shall, subject to provisions afterw

adverted to, be repealed, in favour of the act of last session. By the second clause, the debts, contracts, engagements, &c., previously existing, are to be binding upon the trustees appointed by this act, and upon the property vested in them. The "Lands Clauses Consolidation (Scotland) Act, 1845," so far as applicable, to be incorporated with this act, with the understanding that nothing contained in either act shall authorise the trustees to purchase or use any lands without the consent of the owners, lessees, or occupiers thereof. The "Markets and Fairs Clauses Act, 1847," so far as applicable, and also all the clauses and provisions of the "Commissioners Clauses Act, 1847," with respect to the following matters are to be incorporated with this act—namely, as to the contracts to be entered into, and deeds and mortgages to be executed by the commissioners—the liabilities of the commissioners—legal proceedings by or against them—the appointment and accountability of the officers of the commissioners—and the giving notices and orders. The limits within which this and the incorporated acts are to be put in force, are defined to be—the ancient royalty of the city and royal burgh of Glasgow, and the parliamentary and municipal limits and boundaries, as the same are defined in the act (2 and 3 William IV. c. 65) "to amend the representation of the people in Scotland." The trustees appointed for carrying the purposes of this act into effect are—the lord-provost, magistrates, and council of the city of Glasgow, and their successors in office for the time being. An annual general meeting of the trustees to be held on the third Thursday of July in every year; and, at all trustee meetings, a majority to form a quorum, the lord-provost or the senior magistrate to be preses, who (in case of an equality of votes) is to have a casting vote as well as a deliberative vote. Committees for any of the purposes of this act may be appointed by the trustees; but no business to be transacted at any committee meeting unless the quorum of members, if any, fixed by the trustees, and if no quorum be fixed, three members be present; the chairman (in case of an equal division of votes) to have a casting vote in addition to his vote as a member of the committee. The trustees, from time to time, to appoint managers, inspectors, collectors, and other officers to act under them, and also to appoint properly qualified persons, with reasonable salaries, to act as searchers of tallow within the limits of this act. Books and accounts are to be kept; the same to be balanced once in every year, and to be open at all seasonable times to the inspection of the trustees, and of every creditor on the rates, without any fee being demanded; copies or extracts also to be permitted without any charge; refusal of such permission on the part of the clerk, to incur a penalty of £5 for every default. During the month of May 1851, and in the same month yearly, the sheriff, on the application of the trustees, to appoint an auditor, who shall, once in every year, audit the accounts of the trustees, and his report, together with

that of the trustees, to be read at the annual general meeting; the auditor to receive a sum not exceeding £5 for his trouble. An annual account in abstract of the receipts and expenditure for the year ending the 31st of May, or some other convenient day in each year, to be prepared and certified by the auditor; the same to be open to public inspection on payment of one shilling, and to be printed, published, and transmitted to the town-clerks of Glasgow on or before the 31st of the following January; failure to comply with this enactment, to be visited with a penalty on the trustees of £20. Any six or more persons interested in the accounts, either as creditors on the rates authorised to be levied, or as registered municipal electors of the city of Glasgow, who may be dissatisfied with the report of the auditors, may, within two months after its publication, appeal to the sheriff against such report, and the sheriff shall hear the parties in a summary form, either verbally or in writing, and whose decision shall be final. The 17th clause vests the following important powers in the trustees:—

And be it enacted, that from and after the passing of this act, the whole right and property of and in the existing markets, market-places, and slaughter-houses situated respectively in Duke Street and Gallowgate Street, in Bell Street, in King Street, in Market Lane, and in Scott Street, Cowcaddens, all in the said city; and also the right and property of, and in any new or additional markets, market-places, or slaughter-houses which may be erected and established under the provisions of this act, shall be, and the same are hereby, vested in the trustees, who shall have the sole management and regulation of the markets, market-places, and slaughter-houses erected and established, or to be erected and established, and the sole power of regulating the extent of the accommodation to be allotted to the individuals who may be admitted to use the same, and the time and manner of occupying and using the same, and shall have and exercise every right of property in and over the same, and shall also have power, from time to time, to extend, enlarge, improve, light, cleanse, maintain, and keep in repair the market-places and slaughter-houses, as they shall deem expedient: provided always, that nothing in this enactment contained shall be held to apply to the market on the east side of King Street, nor belonging to the incorporation of fleshers under the contract and deed of agreement herein-before recited.

All arrears of rates and other monies due to the trustees under the recited acts, are to be henceforth vested in the trustees appointed by this act. The 19th clause empowers the trustees to borrow on mortgage any sums not exceeding in the whole £40,000, which sums are to include all monies borrowed under the former acts, and remaining unpaid. The trustees are also further empowered to take from any banking company credit on a cash account, to be opened and kept in the name of the trustees, according to the usage of bankers in Scotland. Trustees (who are not to be held personally liable for any monies, principal, or interest) are empowered to purchase such lands, houses, &c., as may be necessary for the purpose of erecting additional market-places and slaughter-houses, improvements, &c. The next clause also empowers them to improve and enlarge the market-places and slaughter-houses already erected, or which may be hereafter erected, and the accesses thereto, &c., as they may deem expedient—

And to provide such market-places and slaughter-houses with all suitable accommodation, and particularly with all such buildings as may be necessary for the

deposit and manufacture of offal, blood, tallow, garbage, and other products from animals, including standing-room for cattle for a suitable time before being slaughtered, so as to prevent nuisance to the inhabitants, and also, from time to time, to discontinue such market-places and slaughter-houses, or any of them, and to sell and dispose of the lands on which the same were situated, and all the buildings erected thereon: provided always, that before discontinuing any of the market-places or slaughter-houses, sufficient market and slaughter-house accommodation shall be provided by the trustees in some other convenient situation within the limits of this act.

The 24th clause authorises the establishment, in the vicinity of the slaughter-houses, of a market for the sale of the raw hides of the cattle slaughtered in Glasgow; and empowers the trustees to purchase such lands as may be required, and to erect thereon houses, sheds, enclosures, and other necessary buildings, including accommodation for the keeper of the said market. Before proceeding to the erection of any market-places or slaughter-houses, the trustees are to cause to be exhibited for public inspection, at the town-clerk's office, a plan, elevation, and specification of the same, together with an estimate of the probable expense. Several subsequent clauses refer to the tolls to be taken. These are thus enumerated in schedules appended to the act—

Live Cattle Market.—For oxen, cows, bulls, or heifers, 6d. per head; for sheep and lambs, 1s. per score; for calves, 4d. per head; for swine and goats, 3d. per head.

Horse Market.—For every horse or mule above thirteen hands high, 6d.; for every horse, mule, or ass under thirteen hands high, 3d.

Slaughter-houses.—For every ox, cow, bull, or heifer slaughtered, 1s.; for every boar, sow, hog, or pig ditto, 6d; for every calf, ditto, 4d.; for every sheep, lamb, or goat, ditto, 2d. With the addition of 4d. for the use of the cauldron, and hot water for every boar, sow, hog, or pig, if required.

Hide Market.—For each hide of neat oxen or other such cattle, 3d.; ditto of any hog, 1d.; ditto of any calf or sheep, ½d.; ditto of any lamb, ¼d.

Purchasers of Tallow.—For every hundredweight of 112 lb. searched, 5d.

The trustees may lease the market-places and slaughter-houses, or any of the stalls, standing-places, killing-rooms, benches, or other conveniences, or any part thereof, and also the several rates authorised to be levied, for any period not exceeding three years, and upon such terms as shall be agreed upon between the trustees and the proposed lessee. The refuse of the slaughter-houses to belong to the trustees, who may use or sell the same as they shall deem expedient, and apply the proceeds to the purposes of this act. The trustees to pay annually to the treasurer or chamberlain of Glasgow, a ground-annual or rent-charge equal to five per cent per annum on the value of the ground and buildings of the slaughter-houses in Market Lane, and the beef and mutton markets in King Street and Bell Street, and of the rents, dues, &c., surrendered by the corporation to the trustees in virtue of the last-recited act, and which ground-annual is to remain a lien on the market-places and slaughter-houses so far as still the property of the trustees, and to be payable at Whitsunday and Martinmas; provided that nothing in this act shall affect the validity of a decree pronounced by the Sheriff-substitute of Lanarkshire on the 23d of August 1845. The sum of £100 to be also annually paid by the trustees to the incor-

poration of fleshers, as compensation for the value of the manure arising from the slaughtering of cattle by the members of the incorporation—the trustees to be empowered to redeem the said annual payment on giving six months' notice, by paying £2200, being equal to twenty-two years' purchase. The 35th clause refers to the saving rights of the present members of the incorporation of fleshers, and the sons and sons-in-law of such members; the dues payable by whom not to exceed two-thirds of the sums leviable from other persons using the slaughter-houses; such modified dues never to exceed in amount the rates and duties leviable from the said members, as fixed by an act of the magistrates and town-council on the 8th of December 1755, and confirmed by a decision of the Court of Session on the 15th of June 1802: a proviso interdicts the trustees from removing or discontinuing the existing slaughter-house in Market Lane, until new accommodation be provided. The trustees may negotiate with any of the existing members of the said incorporation for the renunciation of their rights and privileges in respect of slaughtering cattle, and paying such compensation as may be mutually agreed upon. The sum of £105 to be paid by the trustees to the incorporation of fleshers as compensation for all loss they may sustain by the number of entrants thereto being diminished by the operation of this act. The 38th clause directs the application of the rates and other monies received by the trustees as follows:—first, in defraying the expenses of this act; secondly, in payment of the feu-duties and ground-annuals; thirdly, in payment of the interest of monies borrowed; fourthly, in maintaining and keeping in repair the market-places and slaughter-houses; and lastly, towards the repayment of the principal monies borrowed under the authority of this act. The next clause empowers the trustees to make such bye-laws, from time to time, for the management and regulation of the slaughter-houses and market-places as they shall think fit, in addition to the purposes for which bye laws may be made under the provisions of the "Markets and Fairs Clauses Act, 1847." The 40th clause interdicts the selling of cattle in any public place within the limits of this act, "or within three miles of the Cross of Glasgow," except in the market-place established by the trustees, under a penalty not exceeding £5, and for every hide similarly sold or exposed to sale, a penalty not exceeding ten shillings; such penalties, however, are not to extend to any cattle or hides "sold in the burgh of Rutherglen, or in the villages of Pollockshaws, Langside, or Long Govan, in the counties of Renfrew and Lanark, or to any private sale thereof in private premises, or to any sale thereof in such premises by a licensed auctioneer; or in the case of raw hides, to any private sale thereof in the slaughter-houses." Any person slaughtering cattle "within one mile beyond the limits of this act," to be liable to a penalty not exceeding £2; and selling or purchasing tallow without being previously searched, to be liable

to a penalty not exceeding £20. Penalty for injuring or defacing market-places or slaughter-houses, not exceeding £5. All penalties to be sued for within six months. The 48th clause specially exempts the burgh of Rutherglen from being affected in its rights and privileges from the operation of this act. In citing this act in legal instruments, it will be sufficient to use the expression "The Glasgow Markets and Slaughter-houses Act, 1850."

ANIMAL CRUELTY, &c.

Cruelty to Animals (*Scotland*).—This act (cap. 92) is "for the more effectual prevention of cruelty to animals in Scotland," being an extension to that country of similar enactments (with necessary variations) contained in an act passed in the previous session applicable to the improper treatment of animals in England and Ireland. The preamble clause of this act, after declaring the expediency of preventing wanton cruelty in the treatment of horses, cattle, and other domestic animals in Scotland, proceeds to enact, that any person convicted of cruelly beating, ill-treating, over-driving, &c., any animal, or causing such cruelty, shall, for every such offence, be liable to a penalty not exceeding £5. A similar penalty is imposed upon every person who shall keep or use, or permit to be used, or act in the management of any place "for the purpose of fighting or baiting any bull, bear, badger, dog, cock, or other kind of animal, whether of domestic or wild nature;" provided always, that every person who shall receive money for the admission of any other person to any such places, shall be deemed to be the keeper thereof. A like penalty is also imposed on every person who shall "in any manner encourage, aid, or assist," at the fighting or baiting of any of the above-named animals. No person to be allowed to use any place for the purpose of slaughtering horses or other animals (not intended for butcher-meat) without being duly licensed by the sheriff of his own county, who shall be first satisfied of the character of the applicant, and upon payment of a sum not exceeding five shillings to the sheriff clerk for making out and recording such license; a copy of which to be open to public inspection on payment of sixpence; and every person so licensed, shall cause to be painted, in large legible characters, on a board to be affixed over the gate or door of such house or place, his or her name, with the words, "Licensed for slaughtering horses, pursuant to an act passed in the session of Parliament holden in the thirteenth and fourteenth years of the reign of her majesty Queen Victoria;" any person failing to do so, to be liable to a penalty not exceeding £5, and a further like penalty for every day during which such board shall not be so affixed. A correct description of all cattle received for slaughtering, to be kept, for the purpose of distinction and identity, by the keepers of slaughter houses; the same to be entered in a book, to

which access may at all times be had for the purpose of inspection or making extracts therefrom, under a penalty of forty shillings for neglect. Persons licensed to slaughter horses, are not to be licensed as "horse dealers" at the same time. Complaints under this act to be made within one calendar month after the commission of the offence, before the sheriff or any justice of the peace or other magistrate, who may summarily dispose of the same: penalties not paid within the time allowed, subject offenders to imprisonment for any time not exceeding two calendar months, unless payment be sooner made; a provision in the same clause gives the magistrate a discretion to dispense with a pecuniary penalty, and adjudge, in lieu thereof, imprisonment not exceeding three calendar months. Any person who may be taken into custody under the provisions of this act, and who may, at the time, have charge of any vehicle or animal, the same may be detained as security for payment of penalty and any expenses incurred, and if necessary to be sold. No action to be brought against any magistrate or other person for anything done under the authority of this act, unless such action shall be commenced within two calendar months after the fact committed; and no action to be commenced until one calendar month after a notice in writing delivered to the defender. The concluding clause declares that nothing which may be any offence under this act, shall be allowed to interfere with the prosecution of the same at common law.—[It will be observed that, unlike the similar act of the previous session, no allusion is made in this act touching the appropriation of penalties.]

Infected sheep and other animals.—In the parliamentary session of 1848, it will be remembered, two acts were passed for remedying the evils consequent upon the discovery of a contagious disorder that had broken out among sheep, cattle, and other animals, (suspected to have been caused by diseased stock imported from abroad,) by which serious losses had accrued to the flockmasters and graziers of this country. One of these acts empowered her Majesty to prohibit from time to time, by Order in Council, as occasion might justify, the importation into the United Kingdom, of cattle, sheep, horses, or other animals, from any places that might be named in such order: the other act had for its object to prevent the propagation of infection, and to this end a series of stringent penalties were enacted against all persons who should expose for sale at any fair or market, sheep or lambs knowing them to be diseased; or who should depasture them upon any uninclosed land; or who should expose for sale meat unfit for human food, &c. The operation of this latter act was limited to two years; namely, from the 1st of September 1848 to the 1st of September 1850. During the last session, (viz. August 14,) an act was passed (cap. 71) declaring it expedient "to continue for another year, and until the end of the then session of Parliament," the act of 1848, for "preventing the

spreading of contagious or infectious disorders among sheep, cattle, and other animals."

FOREIGN CORN, &c.

Abatement of Duties.—In an act, passed last session, "to amend the laws relating to the customs," (cap. 95,) there occurs one short clause, which is useful to be known by the importers of the produce to which it refers. It is this:—

And be it enacted, that no abatement of duties shall be made on account of any damage received by any corn, grain, meal, or flour, imported into the United Kingdom, or the Isle of Man.

Since the above act was passed, circumstances have arisen at one of the outports to call for a more explicit definition of the foregoing clause; and it has been ruled by the customs' authorities, that the intention of the Legislature is to discontinue in future allowances for any increase, "on account of heat," of the measurable quantity of corn on importation from foreign parts, as well as allowances for "actual damage" sustained during the voyage.

TURNPIKE ROADS AND HIGHWAYS.

Turnpike Acts Continuance.—This act (cap. 79) was passed "to continue certain turnpike acts in Great Britain, and to make further provisions respecting turnpike roads in England." The preamble clause enacts that all turnpike acts in Great Britain, which would have expired at the end of the last session, are to be continued until the 1st of October 1851, and to the end of the then next session of Parliament; except certain specified acts passed in the reigns of Geo. III. and IV., which acts refer to the repairing, improving, or incorporating of the following roads:—The road from Gatton Lodge to Povey Cross, Surrey; the road from St John's Chapel, Marylebone, to the north-east end of Ballard's Lane, Finchley, Middlesex; the avenue road and the Marylebone and Finchley turnpike roads; the road from Whitby to Middleton, Yorkshire; and the several roads leading from Lymington to Wilverely Post, in the New Forest. The first operative clause empowers the trustees or commissioners of any turnpike road to reduce, or wholly take off, the tolls on horses, beasts, cattle, and carriages employed in conveying lime for the improvement of land; and also to reimpose the same as they may see occasion: no such reduction, remission, or reimposition, however, to take effect until the same has been submitted to the approval of the Secretary of State: tolls let to farm to be exempted until the expiration of the subsisting contract. The fourth clause, after referring to a section of the act of 1849, for establishing a sinking fund for the discharge of monies thereafter borrowed, (the particulars of which will be found in our analysis of the acts of that session,) declares it expedient to "extend such enactments to debts contracted on the security of the tolls of any road before the

passing of the said act." Two provisos are annexed; one empowering the Secretary of State, if upon application he shall see fit so to do, to authorise the trustees or commissioners not to set apart a sinking fund; the other proviso declares that this enactment shall not interfere with sinking funds formed under any local acts, for the discharge of monies borrowed on the tolls of any turnpike road. Mortgagees of tolls are not to enter into possession of toll-gates, bars, &c., so long as the interest on the mortgage debt is punctually paid; and where no half-yearly, or other periodical day is fixed for the payment of interest, the same shall be deemed to be payable on the 1st of May and the 1st of November in every year. With a view to promote the union of turnpike trusts, the restriction previously existing—which required that three years must expire before a union of trusts could be effected—is by this act repealed. The seventh clause refers to divisions or districts formed in certain trusts, according to the provisions of the acts constituting the same, and declares it expedient that power should be given to unite such divisions or districts into one trust, or to enable such divisions or districts, either separately or collectively, to unite with other trusts. The subsequent part of the clause then details the necessary provisions for facilitating such unions. A schedule is appended to the act, in which are enumerated the titles of divers acts, (twenty-nine in number, and applicable to different counties in England,) which are to continue in force until the 1st of November 1851, and no longer, unless Parliament shall in the mean time continue the same. The concluding clause exempts Ireland from the operation of this act; and also Scotland, "except in respect of the continuance of the acts hereby continued," (namely, those set forth in the schedule.) In citing this act in legal instruments, it will be sufficient to use the expression, "The Annual Turnpike Acts Continuance Act, 1850."

Application of Highway Rates to Turnpike Roads.—This act (cap. 58) was passed "to continue an act for authorising the application of highway rates to turnpike roads." The preamble clause refers to an act passed in the 4th and 5th of her present Majesty, for authorising for one year an application of a portion of the highway rates to turnpike roads in certain cases; which act having been continued by sundry acts until the 1st of October 1850, the object of the statute passed last session is to "further continue" the above act until the 1st of October 1851, "and to the end of the then next session of Parliament."

Regulation of Turnpike Roads in Ireland.—This act (cap. 34) was passed to "continue certain acts for regulating turnpike roads in Ireland." Any existing acts for making, amending, or repairing any turnpike roads in that country, which would otherwise have expired on the 31st of July 1850, are accordingly "further continued for one year"—namely, until the 31st of July 1851—" or, if Parliament be then sitting, until the end of the then session of Parliament." A

provisional clause exempts the application of this act to three statutes of Geo. IV., relative to the repairing and improving of the following roads:—The road from Dublin, by Ashbourne, to Slane and Drogheda; the road leading from Lisburn to Monaghan; and the road from Athy, through Castlecomer, to Kilkenny; and from Castlecomer to Leighlin Bridge, and from Carlow to Castlecomer.

Turnpike Roads and Bridge Trusts (Ireland.)—This act (cap. 4) was passed "for requiring the transmission of annual abstracts of accounts and statements of trustees, or commissioners of turnpike roads and bridges, in Ireland, to the Lord-Lieutenant, to be laid before Parliament." In order to carry out the requirements of this act, it is enacted in the preamble clause, that the trustees or commissioners of every turnpike road or bridge trust in Ireland shall, either by themselves or some committee of their number, annually examine the vouchers and audit the accounts of the officers appointed by them, and also examine into the state of the revenues and debts, distinguishing bonded from floating debts, of the several road or bridge trusts for which they act, and make up abstracts thereof, which are to be signed by not less than three of the trustees or commissioners. The clerks or secretaries of whom having made such abstracts—according to a form prescribed in a schedule appended to the act—are to transmit the same to the Lord-Lieutenant, "or other chief governor or governors of Ireland," on or before the 1st of October 1850; the said accounts to embrace the period of one year, ending the 31st of December 1849. A similar transmission is to be made on the 1st of October in all future years; the abstracts and statements to be for the year ending the 31st of December then next preceding. Refusal or neglect to transmit such abstracts, &c., within the time prescribed, to incur a forfeit for every offence "not exceeding £10, nor less than £5." On receipt of the annual abstracts, the Lord-Lieutenant, or other chief governor, &c., "shall cause the same to be revised, abstracted, and arranged, and laid before both houses of Parliament, together with any observations which he may think proper to be made respecting the state, condition, and repair, of the roads and bridges, or any of them, or respecting the debts, revenues, expenditure, and management, of any such turnpike and bridge trusts." Whenever the trustees or commissioners of any turnpike road or bridge shall enter into a resolution to apply to Parliament for any new turnpike road or bridge act, or for the continuation of the term and [illegible] of any existing act, or for an alteration of tolls or pontages, a copy of such resolution is to be transmitted to the Lord-Lieutenant, or other chief governor, &c., "together with a copy of any special clauses proposed to be inserted in the intended act, and also a statement of the alteration of tolls or pontages intended to be made." The concluding clause declares, that all penalties under [illegible] recovered in the same manner as under

the Irish poor-laws; and to be applied, one moiety to the informer sueing, and the other moiety to the trustees of the road or bridge relating to which the offence may have been committed.*

Petitions.

The following petitions, on matters kindred to agriculture, were presented to parliament during the last session:—

Agricultural Distress—For measures of relief: 372 petitions, 128,842 signatures.
Arterial Drainage, (Ireland)—For completion: 1 petition, 1 signature.
Drainage, (Ireland)—Against proposed allocation of loan: 1 petition, 20 signatures.
Fairs and Markets, (Act 27 Henry VI. c. 5)—For alteration of law: 1 petition, 239 signatures.
Game Laws—For repeal: 4 petitions, 603 signatures.
Highways Bill—Against: 79 petitions, 7800 signatures—for alteration: 3 petitions, 13 signatures—in favour: 14 petitions, 98 signatures.
Highways Bill and Highways (District Surveyors) Bill—Against: 5 petitions, 68 signatures.
Highways Bill and Small Tenements Rating Bill—Against: 1 petition, 1 signature.
Highways (England and Wales) Bill—Against: 1 petition, 63 signatures.
Hops—For repeal of duty: 3 petitions, 278 signatures.
Incumbered Estates (Ireland) Act—For alteration: 3 petitions, 3 signatures.
Land Tax—For equalisation: 9 petitions, 683 signatures.
Landlord and Tenant, (Ireland)—For alteration of law: 21 petitions, 10,691 signatures.
Landlord and Tenant (Ireland) Bill—Against: 18 petitions, 14,969 signatures—for alteration: 1 petition, 250 signatures—in favour: 2 petitions, 401 signatures.
Leasehold Tenure of Land (Ireland) Bill—Against: 2 petitions, 95 signatures.
Leases for Lives (Ireland) Act—Against alteration: 1 petition, 1 signature.
Malt—For repeal of duty: 417 petitions, 32,082 signatures—against repeal: 1 petition, 156 signatures.
Malt and Hops—For repeal of duties: 96 petitions, 7509 signatures.
National Land Company—Complaining of conduct of Mr Feargus O'Connor: 3 petitions, 163 signatures—for inquiry: 1 petition, 40 signatures—for legalisation: 1 petition, 70 signatures—for winding up its affairs under direction of Mr O'Connor: 1 petition, 1 signature—against interference of Government: 2 petitions, 51 signatures—against winding up its affairs: 1 petition, 21 signatures.
Public Markets (Ireland) &c.—For establishment: 1 petition, 60 signatures.
Public Roads—For better management: 1 petition, 1 signature.
Real Property—For relief: 1 petition, 1 signature.
Real Property Conveyance Bill—Against: 5 petitions, 66 signatures.
Real Property Transfer Bill—Against: 1 petition, 85 signatures.
Sale of Land, (Ireland)—For alteration of law: 1 petition, 1 signature.
Tithes—For alteration of law: 1 petition, 52 signatures.
Tithe Commutation Act—For alteration: 20 petitions, 1212 signatures.
Tithe Composition (Ireland) Acts—For alteration: 3 petitions, 158 signatures.
Wheat—For a fixed duty of 10s.: 1 petition, 1 signature.

---

* The remaining part of this paper, containing the legislative measures regarding Local Turnpike Acts, Registration of Lands in Ireland, and the Acts on Markets and Fairs, is reserved for the next number.—Ed.

AGRICULTURE IN CHINA.*

Soon after the close of our late war with the Celestial Empire, the Horticultural Society of London despatched Mr Fortune as their botanical collector to China, to investigate the flora of that almost unknown country; and his energy and enterprise, no less than his professional abilities, during three years' labours, brought his interesting mission to a successful close. Since his return he has published a volume on his wanderings, which is especially worthy of notice for the closeness with which he has investigated the topics of which he treats, and for the impartial and unexaggerated tone of his remarks. His work contains many entertaining anecdotes of his adventures, and some valuable observations on the people; but we restrict our attention to the portions of it which treat of the agriculture and horticulture of China. Most erroneous ideas on these topics have hitherto prevailed in Europe, partly from the superficial examination and limited observation of former travellers in the Celestial Empire, partly from their ignorance in regard to matters agricultural. No reliance could be placed on their statements or opinions—some praising Chinese cultivation to the very skies, others dismissing it with undeserved contempt; so that we hail Mr Fortune's able and truthful volume with much satisfaction, as it enables us to form correct conclusions on this hitherto mystified subject, and to present a digest of them to the reader.

The Empire of China includes both tropical and temperate regions in its vast extent, and, from its geographical position, is liable to much greater extremes of heat in summer, and cold in winter, than we have in Western Europe. At Hong-kong and Canton, in the south, the winter months are dry; but at Shanghae, in the north, heavy and continued falls of rain and snow are of frequent occurrence. "In fact," says Mr Fortune, "the climate of northern China † has a greater resemblance to that of the south of England or France than it has to that of the southern parts of the Chinese empire; and, although hotter, used always to remind me of the beautiful summers we have in England once in every ten or twelve years. The sky is for days without a cloud, and in the evening a heavy dew falls and refreshes vegetation."

Of the topography of the interior of China we as yet know little; the coast alone is generally known to us, and it is in few places that our knowledge of the country extends sixty or seventy miles from the sea. So far as our observations extend, the south of

* *Three Years' Wanderings in the Northern Provinces of China, including a Visit to the Tea, Silk, and Cotton Countries; with an Account of the Agriculture and Horticulture of the Chinese.* By Robert Fortune. London: 1847.

† The district so called by our author is in reality *Central* China. We have retained his phraseology throughout, but append this note to prevent mistake.

China is composed of barren mountains. Rocks of granite are seen everywhere protruding above the scanty vegetation; the soil itself is composed of dry burnt clay, mixed with particles of granite in a decaying or disintegrated state; and its natural poverty is rendered permanent by the practice of periodically cutting and carrying off the long grass and stunted bushes for firewood. In the valleys and plains, the soil consists of a strong stiff clay, mixed with a small portion of sand, but containing scarcely any vegetable matter or humus. This is its composition about Canton and Macao, and in fact over all the provinces of the south,—unless perhaps in the vicinity of large towns, where its natural character has been altered to a certain extent by the influence of manure. About four or five hundred miles northward from Hong-kong, a visible change takes place in the soil and vegetation. "I have ascended hills near the mouth of the Min," says Mr Fortune, "at least three thousand feet above the level of the sea, which were under cultivation to their summit." On the hills there the soil is a gravelly loam, which, though far from rich, repays the labour of cultivation; and in the low grounds it is an excellent strong loam, not unlike what we find in some of our best wheat lands in England and Scotland, and capable of producing excellent crops. These features of the country continue for some three hundred miles farther north, up to the latitude of Chusan—the mountains gradually sinking, and finally disappearing in the level district surrounding the Bay of Hangchow. At Chapoo, on the northern shore of this bay, Mr Fortune ascended some low hills near the coast. "Here it is," says he, "that the hills of the south end, and the wide plain of the Yang-tse-Kiang commences. On one side, looking towards the south and west, mountains are seen towering in all their grandeur; whilst, on the northern side, the eye rests on a rich and level plain, watered by its thousand canals, and dotted all over with towns and villages, peopled with an immense number of industrious and happy human beings." This district is the very garden of China; and so low-lying is it, that it is intersected in all directions by canals and rivers, up which the tide flows to a great distance, and almost the whole transport of the district is carried on by water. Such a country of course presents every facility for irrigation, which we will by-and-by see is duly taken advantage of; but, at the same time, it possesses few barriers against inundations in very rainy seasons. Of this, the *Peking Gazette* for last year furnishes us with most melancholy proofs; an extent of country equal to all Britain was then submerged, and the destruction done has not been paralleled for generations.

The Yang-tse-Kiang, or "Child of the Ocean"—the agent of all this fertility and oft-recurring misery—is a river second only to the Amazons and Mississippi in magnitude, and rolls its mighty waters from the deserts of Tartary, eastwards through China, to

the Pacific. The vast plain through which it flows is so flat, that as one sails along its shores, even from the highest mast not a hill is to be descried on the farthest horizon. Landing at Shanghae, Mr Fortune found the nearest hills fully forty miles distant from the sea,—and these merely isolated heights or knolls, not more than two or three hundred feet high. "From their summit, on a clear day," says he, "I looked round in all directions, and was only able to see some hills, apparently having the same isolated character, far away on the southern horizon." All the rest of the country was a vast level plain, without a mountain or a hill to break the monotony of the view, and intersected (as we have said) by a network of rivers and canals. "The soil is a rich deep loam, and produces heavy crops of wheat, barley, rice, and cotton, besides an immense quantity of green vegetable crops." In some places the land is below the level of the rivers, and there rice is grown; but the greater part is above their level, and is well adapted for the cultivation of the cotton plant. Indeed, this is the great Nanking cotton country, which supplies all China, as well as the adjoining islands of the Archipelago. "The soil of this district," continues our author, "is not only remarkably fertile, but agriculture seems more advanced, and bears a greater resemblance to what it is at home, than in any part of China which I have seen. One here meets with a farmyard containing stacks regularly built up and thatched in the same form and manner as we find them in England; the land, too, is ridged and furrowed in the same way; and were it not for plantations of bamboos, and the long tails and general costume of the natives, a man might almost imagine himself on the banks of the Thames."

Every agricultural operation in China is done with the greatest regularity, at certain stated times which experience has proved to be the best; and in nothing is this more apparent than in the manuring of the cotton fields. Early in April the agricultural labourers, all over the country, are seen busily employed in clearing the numerous canals, ponds, and ditches; and the mud thus obtained—which has been formed by the decay of long grass, reeds, and succulent water-plants, and partly by the surface-soil, which has been washed down from the higher grounds by the rains—is conveyed away, and spread over the cotton fields. Roadside scrapings and burnt rubbish are saved up for the same purpose. Previous to this manuring, the soil has either been ploughed by the small buffalo-plough* in common use in the country, and then

* This plough has a beam, a handle, and a share, with a wooden stem, and a rest behind, instead of a mouldboard. It is a rude instrument, and as the ploughman often *winds* his work under water, a tasteful ridge is beyond the sphere of his contemplation. But Mr Fortune and Mr Lay agree that it answers the purpose; the former adding, "probably much better than ours would, which has been found to be too heavy and unmanageable for the Chinese. Some of our ploughs have been offered to the native farmers *gratis*, but they will not use them."—p. 296. In China, utility is the only quality sought for, appearance being altogether slighted.

broken and pulverised by the three-pronged hoe, or, in those instances where the farms are small, and cannot boast of a buffalo, it is loosened and broken up entirely by manual labour. In the end of April and beginning of May, the cotton seeds are carried in baskets to the fields, and sown generally broadcast, but sometimes in drills or patches. The fields are carefully tended during growth: the plants are thinned where they have been sown too thickly, the earth is loosened amongst the roots, and the ground hoed and kept clear from weeds. The cotton-plant produces its flowers in succession from August to the end of October; and as the pods are bursting every day, it is necessary to have them gathered with great regularity, otherwise they fall upon the ground, and the cotton gets dirty, which of course lowers its value in the market. At this season, accordingly, little bands of Chinese are seen in the afternoon in every field, gathering the ripe cotton, and carrying it home to the farmyard, where it is spread out to the sun on hurdles, but is always taken under cover at night. When perfectly dry, it is separated from the seeds by the well-known wheel with two rollers, which, when turned round, draws or sucks in the cotton and rejects the seeds. "It is a simple and beautiful contrivance," says Mr Fortune, "and answers well the end for which it is designed." The cotton is now ready for market,—and early in the fine autumnal mornings, the roads leading into Shanghae (the emporium of the district) are crowded with bands of coolies or small farmers, from the cotton farms, each with his bamboo across his shoulders, and a large sack of cotton swung from each end. These coolies—many of whom bring their own produce to market—are very independent in their dealings: should the price offered by the merchant be below the owner's expectation, he immediately shoulders his load and walks off to a rival warehouse; and a similar independence characterises the peasant farmers in all their other dealings. "Before the cotton is converted into thread for the purpose of weaving, it is cleaned and freed from knots by a process common also in our Indian possessions — viz. by an elastic bow, the string of which is passed under a portion of the cotton placed on a table, throws it into the air by the vibration which is kept up by the workmen, and separates the fibre without at all breaking or injuring it: at the same time the wind caused by the sudden vibration carries off the dust and other impurities. After this process the Chinese cotton is particularly pure and soft, and is considered by good judges not to be surpassed by any in the world." Every small farmer or cottager reserves a portion of his cotton produce for the wants of his own family; and this is cleaned, spun, and woven by the female members, sometimes assisted by the old men or young boys who are unfit for the labours of the field. In every cottage throughout the cotton district the traveller meets with the spinning-wheel and the small handloom, which used to be common in

our own country in former times, but which have now given way to machinery. Where the families are numerous and industrious, a surplus of cloth is thus woven; in which case it is sold at the adjacent towns, and money is thence realised for the purchase of tea and other necessaries which are not produced in this particular district.

With the usual providence of the Chinese, every part of the cotton crop is turned to account. The cotton itself clothes them, and affords them the means of supplying them with all the necessaries of life; the stalks boil their frugal meals; and the ashes even—the remains of all—are strewed over their fields for the purposes of manure. Moreover, as they always extract two, and sometimes three, crops from the soil in the course of the year, they have adopted the plan of sowing or planting fresh crops before the removal of those which occupy the ground. "Wheat, for example, which is a winter crop, is reaped in the Shanghae district generally about the end of May, while the proper time for putting in the cotton seed is the beginning of that month or the end of April. In order, therefore, to have cotton on the wheat-lands, the Chinese sow its seeds at the usual time amongst the wheat; and when the latter is reaped, the former is several inches above ground, and ready to grow with vigour when it is more fully exposed to the air." In like manner, clover, beans, and other vegetables are frequently above ground in the cotton fields before the stalks of the latter are removed. Thus the Chinese, in the northern provinces, lengthen by every means in their power, the period of growth, and gain as much as they possibly can from the fertility of their land. The reader must bear in mind, however, that the soil of this district is a rich deep loam, which is able to yield many crops in succession, without the aid of a particle of manure, while the climate is capable of bringing to perfection many of the productions of the tropics, as well as all those indigenous to the temperate regions of the globe.

Notwithstanding the fertility of much of their soil, there is no nation that equals the Chinese in the diligent collection and application of manure. Of the chemical manures which science has recently introduced into western Europe, they know nothing; but they make the most of what they have, and in the eager collection of nightsoil, they even beat the Dutch! In all their towns, large cisterns or earthen tubs are placed in the most conspicuous and convenient places for the reception of this kind of manure; and what would be considered an intolerable nuisance in Europe, is here looked upon by all classes, rich and poor, with the utmost complacency. Almost every Chinese town is permeated by canals; and, on these, long clumsy boats are placed in different districts of the town, into which the nightsoil and urine are emptied, and conveyed from thence to the country. This manure is sometimes used after fermentation, but frequently not. In the fertile agricultural districts of the north, this stimulant is used in a fresh

state, being of course sufficiently diluted with water before it is applied to the crops. And there can be little doubt that in this the Chinese are perfectly right; as the manure must be much more efficient in this state than when a great portion of the ammonia has passed off into the air.* A strong stimulant like this would probably in ordinary circumstances have an injurious effect; but as it is used only when the crops are young and luxuriant, they are then able to assimilate its gases, and a most marked effect is produced upon their growth and productiveness. This kind of liquid-manure is generally applied to wheat, barley, and all the cabbage tribe and other garden vegetables; but not to rice, which is always flooded during its growth.

For rice the manures are manifold, but necessarily they are always applied at or before sowing. As, from the scarcity of fire-wood in China, a great portion of the straw, cotton stalks, and grass, which would go to manure the fields, is used for firing, necessity has forced upon farmers the plan of *growing manures*. In the island of Chusan, and over all the rice-country of Che-kiang and Kiang-soo, two plants are cultivated during winter almost exclusively for manure: the one is a species of Coronilla, the other is Trefoil or clover. They are sown in ridges in autumn, and grow luxuriantly till April, when it is necessary to prepare the ground for rice. The ridges are then levelled, and the manure-plants are scattered in a fresh state over the surface of the ground; the fields are next flooded, the plough and harrow are employed, and the manure, thus half buried amongst mud and water, begins to decay immediately, and gives out a most disagreeable putrid smell. This mode of manuring is generally practised in all the rice-lands in this part of China, and the young paddy doubtless derives strong nourishment from the ammonia given out in the decomposition of this fresh manure. The Chinese farmer is not a chemist; he knows little of vegetable physiology; but his fore-fathers have hit accidentally upon certain systems which are found in practice to succeed, and to these he himself adheres, and hands them down unchanged to his children.

When the first crop of rice is cut, the second, which has been planted in the alternate rows, is left to grow and ripen in the autumn; the ground is stirred up; and the stubble and part of the straw of the first crop is immediately worked up with the mud and water between the rows: this decays in the same manner as the trefoil in spring, and affords manure to the second crop. Prawns and fish are frequently used for the same purpose and in the same way.

* Mr Lay considers that the storing of manure in tanks is the more usual practice; and remarks—"The laying up the *rejectamenta* of a town in tanks, exposed to the influence of the weather, and the spreading forth of some parts [on the surface of the ground] to dry and waste in the sun, once seemed to me to be needless processes: inquiry and reflection, however, have since altered my opinion, and I am now disposed to think the Chinese are right."—LAY's *Chinese as they Are*.

Burnt earth mixed with decomposed vegetable matter is another highly esteemed manure, and is common in all the agricultural districts. During the summer months, all sorts of vegetable rubbish are collected in heaps by the roadside, and mixed with straw, grass, parings of turf, &c., which are set on fire and burn slowly for several days, until all the rank vegetable matter is decomposed, and the whole reduced to a rich black earth. It is then turned over several times, when it presents the same appearance as the vegetable mould used in gardens in England. This manure is not scattered over the land, but reserved for covering the seeds, and is applied in the following manner. When the seedtime arrives, one man makes the holes, another follows and drops in the seed, and a third puts a handful of the black earth on the top of them. Being principally vegetable mould, it keeps the seed loose and moist during the period of germination, and afterwards affords them nourishment. This manure is useful mechanically as well as chemically in a stiff soil like that of the low lands of China, where the seeds are apt to be injured in the process of germination. The young crop thus planted acquires a vigour in its first growth, which enables it to assimilate the matter which forms the strong stiff soil, and to strike its roots firmly into it.

Oilcake also (manufactured from the seeds of a certain kind of cabbage, and some other oleaginous plants) is broken in pieces and scattered broadcast over the land, or applied in the same manner as the vegetable earth; while bones, shells, old lime, soot, ashes, and all kinds of rubbish, are also eagerly bought up by the farmer. From this imperfect summary it will be seen how little we are ahead of the Celestials in the kinds of our manures, and how much we are behind them in the diligent collection of fertilising matter. Indeed, there appears to be less waste of fertilising matter in China than in any country in the world.

Rice, being the chief article of food in China, is of course the staple production of the country,—more particularly in the south, where two crops of it can easily be raised in the hot months, besides another crop of some more hardy vegetable in winter. Whenever possible, it is grown on lower levels than the cotton plant, frequently on flats below the level of the adjoining rivers, in order to facilitate its flooding; and the soil, in such places, is generally a stiff clay—perhaps from the vegetable mould being washed away by the frequent floodings. But the spots most favourable for the cultivation of rice are such as are of an alluvial kind; as, for instance, where the soil is carried along by the streams which tumble down the sides of the hills, and being deposited near their feet, gives breadth to the little valleys, or forms a delta at their mouth. In this way a field or farm is produced fit for the tiller; and the stream which deposited it still supplies a stock of water to replenish the banks and furrows. "Thus, by a simple and beautiful provision of nature, the meadow is formed and irrigated by the same cause. The fields are parted by neat terraces, beside which the rills often glide in refreshing lapse, and the little fish sport in the radiance of a summer's sun."

As the land is inundated before the ploughing commences, this is nothing else than turning up a layer of mud and water six or eight inches deep—the labourer and his bullock, of course, wading all the time. The water-buffalo generally employed in the south is well adapted for this work, as he delights to

wallow amongst the mud, and is often found swimming and amusing himself in the canals on the side of the rice-fields; but it appears a most disagreeable and unhealthy operation for the poor labourer, who nevertheless goes along cheerful and happy. After this comes the harrows:* the object of both ploughing and harrowing being, not only to loosen the earth, but to mix up the whole until it forms a puddle, and its surface becomes smooth and soft. In this condition it is ready to receive the young rice-plants, which some time before have been sown thickly† in small patches of highly manured ground, the seeds, in some districts, being steeped in liquid manure before being sown. When about ten inches in height, the plants are next carefully lifted by passing a kind of share below their fine roots, and removed in a basket to the field, where they are put in in patches, each containing about a dozen plants, and in rows from ten to twelve inches apart each way. "The operation of planting is performed with astonishing rapidity.‡ A labourer takes a number of plants under his left arm, and drops them in bundles over the land about to be planted, as he knows almost to a plant what number will be required. These little bundles are then taken up, and the proper number of plants selected and plunged by the hand into the muddy soil. When the hand is drawn up, the water immediately rushes into the hole, carrying with it a portion of soil to cover the roots, and the seedlings are thus planted and covered in without further trouble." Two crops of rice, as we have said, are thus annually raised in the south of China, besides a winter one of vegetables; but in the latitude of Ningpo, where the summer is much shorter, the farmers have to plant the second crop two or three weeks after the first, in alternate rows; while in the Shanghae district, about a hundred miles still further north, one crop alone can be raised.

During the growth of the rice, the fields are always kept flooded, when water can be obtained. The terraces near the base of the hills are supplied by the mountain-streamlets, and the fields which are above the level of any adjoining river or canal are inundated by means of the celebrated water-wheel,§ which is in use all over

* The Chinese harrows are a little more passable in outward figure than their plough. They are provided with three rows of teeth, and a handle to support the labourer, who *stands upon them*, in order to increase their effect by adding to their weight.

† "There is some philosophy in this," says Mr Lay, "as seeds will germinate better when closely strewn than when scattered at a distance from each other: the convivial adage, 'the more the merrier,' is quite applicable to the process of germination. The sprouting is connected with the chemical change or fermentation of the constituents of the grain, which depends for its intensity upon the heat of the whole mass. 'If two lie together, then they have heat: but how can one be warm alone?'"—LAY'S *Chinese as they Are*, p. 120.

‡ Mr Lay corroborates Mr Fortune's account, and states that "a man is able, by an ordinary exertion of his powers, to set from twenty to twenty-five plants within the minute."

§ This wheel "raises the water by a series of float-boards, which traverse in a trough, and sweep the fluid with them. It is somewhat upon the principle of our chain-pump, which lifts the water by a line of buckets; but, instead of the bucket,

the country. During the summer it is necessary, or at least advantageous, to go over the ground once or twice, stirring the soil up well amongst the roots, and removing any weeds which may have sprung up. When the crops are nearly ripe, the water is let off, as no longer necessary; but if the weather is wet, the fields retain the water for a considerable time; and then it is no uncommon thing to see the natives wading nearly up to the knees in mud and water, when they are gathering in the harvest. The rice crops are cut with a small instrument not unlike our reaping-hook, (much grain being lost, as there needs only a shake to dislodge it,) and are generally thrashed out at once on the fields (if dry) where they are grown. Sometimes, however, more particularly in the north, the rice is tied up in sheaves, and carried home before it is thrashed; indeed, "everything in the northern agriculture of the Chinese has a great resemblance to what is practised in Europe." When threshed in the fields, an assistant takes up the bundles as they are laid down by the reaper, and strikes them upon the side of a tub, which summarily completes the process of threshing. A curtain surrounds one half of the tub, to screen the grains from the impulse of the wind. In some kinds of rice, however, the kernels refuse to quit their lodgings upon so short a notice; and the sheaves are then carried to a threshing-floor, and beaten with a flail which in shape exactly resembles our own. But the Chinaman simply moves the "swingel" round, as if he were using a whip; whereas the sturdy hind in our barns makes it revolve round his head to accelerate its velocity. In the one case there is an art—in the other, there is none.

The following are Mr Fortune's remarks on the interesting subject of the terrace cultivation and irrigation of the Chinese:—

The terrace cultivation of China has been noticed by nearly all writers upon this country, and, like most other subjects, it has been either much exaggerated or undervalued. It appeared to me to be carried to the greatest perfection on the hillsides adjacent to the river Min near Foo-chow-foo; at least I was more struck with it there than anywhere else. On sailing up that beautiful river, these terraces look like steps in the sides of the mountains—one rising above another, until they sometimes reach six or eight hundred feet above the level of the sea. When the rice and other crops are young, these terraces are clothed in luxuriant green, and look like a collection of gardens among the rugged and barren mountains. The terrace system is adopted by the Chinese, either for the purpose of supplying the hillsides with water where paddy [rice] is to be grown, or to prevent the heavy rains washing down the loose soil from the roots of other vegetables. Hence these cuttings are seen all over the sides of the hills, not exactly level like the rice-terraces, but level enough to answer the purpose of checking the rains in their descent down the mountain. For the same reason, the sweet potato and other crops which are grown on the hills are always planted in ridges which run cross-ways or horizontally; for were the ridges made in a different direction, the heavy rains which fall in the early summer months would carry both the loose soil and crops down into the plains.

Rice is grown on the lower terrace-ground, and a stream of water is always led

---

t has merely a flat piece of board, which, by exactly fitting the channel in which it moves, confines the water between itself and its fellow. In fact the bottom, two sides of the trough, and the two successive float-boards, compose a sort of extemporary bucket. Our newly-discovered method of raising water by means of a band s only [illegible] ahead of this in simplicity." [illegible]'s *Chinese as they Are*, p. 122-123.

from some ravine and made to flow across the sides of the hills, until it reaches the highest [rice] terrace, into which it flows and floods the whole of the level space. When the water rises three or four inches in height, which is sufficiently high for the rice, it finds vent at an opening made for the purpose in the bank, through which it flows into the terrace below, which it floods in the same manner, and so on to the lowest. In this way the whole of the rice terraces are kept continually flooded, until the stalks of the crops assume a yellow ripening hue, when the water being no longer required, it is turned back into its natural channel, or led to a different part of the hill for the nourishment of other crops. These mountain-streams, which abound in all parts of the hilly districts, are of the greatest importance to the farmer ; and as they generally spring from a high elevation in the ravines, they can be conducted at pleasure over all the lower parts of the hills. No operation in agriculture gives him and his labourers more pleasure than leading these streams of water from one place to another, and making them subservient to their purposes. In my travels in the country the inhabitants often called my attention to this branch of their operations; and I pleased them much when I expressed admiration at the skill with which they executed it. This practice is not confined to the paddy grounds; for I remember once, when superintending the planting of some large trees and shrubs in the gardens of Messrs Dent & Co. in Hongkong, after I had given them a large supply of water at the time they were planted, I desired the gardener to repeat the dose next morning. But, on the following day, when I returned to the spot, I was surprised to find a little stream divided into many branches, and meandering amongst the roots of the newly planted trees. As there was no stream there before, I went up to examine its source, and found that it had been led from a neighbouring ravine; a work more easy than carrying a large supply of water in buckets, and at the same time more effectual.

This system of irrigation is thus neatly described by the oldest of uninspired bards, Homer—

> So when a peasant to his garden brings
> Soft rills of water from the bubbling springs,
> And calls the floods from high to bless his bowers,
> And feed with pregnant streams his plants and flowers;
> Soon as he clears whate'er their passage staid,
> And marks the future torrents with his spade,
> Swift o'er the rolling pebbles, down the hills
> Louder and louder purl the falling rills ;
> Before him scattering, they prevent his pains,
> And shine in many wanderings o'er the plains.

The use of the bucket is also very ancient; and Mr Lay says it answers the purpose of a simple and rapid conveyance of water much better than one would conjecture. When in use, it is suspended between two men, each of whom having hold of two strings attached to it; they fill the bucket by lowering it into the pond, raise it by pulling, and then, by a sudden jerk, empty the contents into the head of the canal, or into the field—these, of course, being in immediate proximity to the river. By this process, one is reminded of that passage in the book of Numbers—" He shall pour the water out of his buckets, and his seed shall be in many waters."

The summer productions of the plains are, as we have seen, rice and cotton, but on the hilly country the staple produce is earthnuts and sweet potatoes; the former being grown most extensively in the southern provinces, more particularly in Fokien, —while the sweet potatoes are better a little farther north, where they form the chief hill-crop. In April, those roots of the sweet potato which have been saved for seed are planted thickly in beds

near the houses, or in the corners of fields; and as they begin to push out young shoots immediately, these are ready to be taken off by the beginning of May. It is astonishing how well these cuttings thrive, considering the little care expended upon them; but we must remember that this is the commencement of the rainy season, and that the sky is generally cloudy, and the air saturated with moisture.

The winter crops in the south, around Canton and Macao, consist of large quantities of our European vegetables—such as potatoes, peas, onions, and cabbages, which are grown for the supply of the Europeans who reside at Hongkong or Canton. The indigenous varieties of the cabbage tribe never produce a solid heart like ours, and are of no value when imported to England; but the celebrated *Pah-tsae*, or white cabbage of Shantung and Peking, is a delicious vegetable, and large quantities are brought south every autumn by the coasting junks. In the northern provinces the principal winter productions are wheat, barley, peas, beans, the cabbage oil-plant (cultivated for the sake of the oil extracted from its seeds,) and various other vegetables of lesser note. These crops are sown on the hills as well as in the low lands, and on the ground which produces the sweet potatoes in summer. "About Chinchew and Amoy, the wheat crops are so poor that the labourers pull them up by the hand, in the same manner as we do on our moorlands in England and Scotland. They are of course much better in the rich district of Shanghae, but the varieties of both wheat and barley are far inferior to ours; and as the Chinese sow them too thickly, they are generally much drawn at the heads, and the corn small." In any comparison of this kind, however, it is important to recollect that wheat and barley are the staple and most carefully reared crops in this country, whereas they are only a winter crop in China, and hold a very subordinate place in its agriculture.

There is no regular system of fallowing in China, nor is the rotation of crops much known or practised. Indeed, as regards the low lands, "the soil being a kind of stiff strong clay, capable of yielding many crops of rice in succession without being in any way burdened, no such mode of cultivation is necessary." "By Chinese economy in reference to manure," says Mr Lay, "and by a constant plying of the soil with the plough and the mattock, fallows seem to be rendered unnecessary; and the land yields a maximum produce without a periodical release, to exterminate the weeds or to invigorate its energies."—(p. 125.) Yet it must not be supposed that the whole of the land is always under crop, and that, as some writers inform us, it never for a moment lies idle—for such is not the case. Moreover, Mr Fortune tells us that, even "in the most fertile districts of Central China, it would be ridiculous to assert, as some have done, that the whole, or even greater part is under cultivation. On the contrary, by far

the greater part lies in a state of nature, and has never been disturbed by the hand of man. I am anxious to state this fact in express terms, in order to set those right who have been led to believe that every inch of land in the empire, however bleak and barren, is under cultivation, having given way to Chinese industry and skill! I myself, before I visited China, was under the same impression; but the first glance of the rugged mountainous shores [of the southern provinces] convinced me of my error. Unfortunately our opinions of a distant unknown country are apt to go to extremes, either fancying it entirely barren, or else a paradise of fertility."

All this is very true; but the remark is so pointedly made that it may lead the unwary into the opposite error. The "rugged mountainous shores" are uncultivated certainly, and will remain so to the crack of doom; but we suspect that, in other respects, Mr Fortune's honest anxiety to refute his predecessors' statements has unintentionally over-coloured his own. He himself tells us that he has seen mountains near Foo-chow-foo cultivated to their summits, though three thousand feet high,* and tiers of terraces carried up for eight hundred feet, "like a collection of gardens among the rugged and barren mountains;"† while Lord Jocelyn describes a similar scene on the bleak mountain-shores of Manchooria.‡ Waste lands are freely bestowed on applicants by Government, says Mr Gutzlaff; and their cultivation is encouraged by no taxes being imposed till the land has become remunerative to its owner.§ Mr Martin also, speaking of this economy of land in China, asserts, after full inspection, that "if such an amount of waste land were to exist, as in Ireland, five years would not elapse without its being made fertile and productive."‖ Indeed, the reclamation of waste grounds is an object of peculiar interest both to the Government and people; and in a pamphlet published at Hongkong, so recently as March last, we observe that such operations, under the auspices of the State, are at present being carried on successfully in the remote district of Cashgar, about 1700 miles distant from the frontiers of China Proper.¶

The wonders of machinery, which have effected such a revolution in our manufactures within the last half century, find no counterpart in China: there the operations and instruments of the people are alike simple—we would almost say rude, were it not for the efficient results which they accomplish. The theorising, speculative spirit from which the invention of ingenious and complex machinery proceeds, has little place in Chinese intellect; but an ability for details, and long centuries of experience, have enabled

* *Wanderings in China*, p. 293. † *Ibid.*, p. 302.
‡ *Six Months with the Chinese Expedition*, p. 106.
§ *China Opened*, vol. ii. p. 16.
‖ *Ireland before and after the Union*, p. 88.
¶ *Notes on the Condition and Government of the Chinese Empire in* 1849. By Francis Wade, Assistant-Chinese Secretary, p. 80.

them to turn their instruments to the best account. Moreover, demand is the great parent of invention; and we generally find that the higher kinds of machinery, which require large capital to work them, never make their appearance until after that capital has been accumulated. Now, in China there is little money available for agricultural machinery, for farms are universally small, and their owners' capital trifling; and from the absence of the law of primogeniture, large fortunes seldom survive a single generation. Nevertheless, if large fortunes be absent, so also is real want. Agriculture is not a pursuit that tends to accumulate great wealth in the hands of individuals; but it is more steady in its profits than the pursuits of commerce, and, regarded as a national occupation, its tendency is to keep a larger population in healthy and comfortable circumstances than any other branch of industry. Hence there is no country in the world where the proverb "Money begets money, and poverty begets poverty," is less applicable than in China. The evil of capital crushing labour (at present so universally complained of in France and this country) is there unknown: land can be had for the asking; and machinery, such as it is, is low-priced, and within the reach of all. No millionnaire manufacturers, with machinery costing £30,000 or £40,000, overwhelm all competition, and, by ruining small traders, draw starving thousands to cotton-mills at Nanking or Shanghae, feeding the towns to plethora at the expense of the country, and accumulating, from the labour of thousands, gigantic fortunes for individuals. The small farmer rears his crop of rice, cotton, or tea, dresses and sends it to market, or turns it to his own use as food or clothing. Uncrushed by capital, his humble industry ever meets its reward.

The farms throughout China are generally small, each consisting of from one to four or five acres.* The cottages are rude and simple in their construction, being built for the most part of mud and stone, with earthen floors—reminding one of what we used to see in Scotland in former times, when the cow and the pig lived and fed in the same home with the peasant. Scottish cottages, however, even in those days, were always better furnished and more comfortable than those of the Chinese are at the present time. Owing to the scarcity of fuel, to which we have already alluded, the Chinese have no fires in their houses in winter; they accommodate themselves to the varying temperature of the seasons by successively adding to the thickness of their wrappings as the cold deepens, and by gradually "peeling" themselves as spring advances. Hence "a chimney is a secondary consideration with the Chinese," says Mr Fortune; "and, in instances which I have seen, the smoke, after passing below the pan for drying the tea, was allowed to escape, as it best could, through the doors and roofs of the houses,—which indeed, in China, is no difficult matter."

* *Wanderings in China*, p. 201.

The truth seems to be, that the generality of Chinese houses are built for the heats of their scorching summers; and they trust to additional clothing to keep out the cold of winter.

"There are few sights more pleasing than a Chinese family in the interior engaged in gathering the leaves of the tea-plant, or, indeed, in any of their agricultural pursuits. There is the old man—it may be the grandfather, or even the great-grandfather—patriarch-like directing his descendants, many of whom are in their youth and prime, while others are in their childhood, in the labours of the field. He stands in the midst of them, bowed down with age, but—to the honour of the Chinese as a nation—he is always looked up to by all with pride and affection, and his old age and grey hairs are honoured, revered, and loved." In the tea districts, every cottager or small farmer has his own little tea garden, the produce of which supplies the wants of his family, and the surplus brings him in a few dollars, which procure him the other necessaries of life. The same system is practised in everything relating to Chinese agriculture. "When, after the labours of the day are over," says Mr Fortune, "they return to their humble and happy homes, their fare consists chiefly of rice, fish, and vegetables, which they enjoy with great zest, and are happy and contented. I really believe that there is no country in the world where the agricultural population are better off than they are in the north of China. Labour with them is pleasure, for its fruits are eaten by themselves, and the rod of the oppressor is unfelt and unknown." "For a few *cash*," he says in another place, "(1000 or 1200 cash = 1 dollar) a Chinese can dine in a sumptuous manner upon his rice, fish, vegetables, and tea; and I fully believe, that in no country in the world is there less real misery and want than in China. The very beggars seem a kind of jolly crew, and are kindly treated by the inhabitants."

Chinese jealousy and suspicion of foreigners is proverbial, and the Imperial Government does all in its power to prevent strangers spying out the Flowery Land. Mr Fortune had many rencontres on this subject with the Mandarins: in some cases he outgeneraled them, in others he set them at defiance. Secretly, and in a Chinese dress, he contrived to visit the great city of Soo-Chow, the centre of Chinese fashion, and an earthly paradise in the estimation of the Celestials. Nevertheless, with this exception, his wanderings were limited to a stripe of from twenty to sixty miles broad along the coast. Hence the great silk districts of Central China were beyond his reach; but he passed through and describes the silk district of Hang-Chow; and as Chinese operations are identical in all parts of the empire, except in so far as they are modified by difference of climate, the district which he saw may be taken as a pretty close sample of the others which were beyond his reach. At Hang-Chow the mulberry trees are all grafted, and produce very fine thick leaves; indeed, the silk produced in this

district is amongst the finest in China—though whether this is owing to the particular variety of the mulberry tree used in feeding the worms, or to soil or climate, still remains to be ascertained. "The trees, or rather shrubs, are planted in rows, the banks of the canal being a favourite situation; and they are not allowed to grow more than from four to six feet in height. The natives set to work with a pair of strong scissors, and cut all the young shoots off close by the stump; they are then either stripped of their leaves, or taken home in bundles, and stripped afterwards. Before this operation takes place, the plants seem in a high state of health, producing vigorous shoots, and fine large thick shining leaves. After the leaves have been taken off, the bushes look like a collection of dead stumps, and in the middle of summer have a curious wintry appearance; but the rain, which falls copiously, and the fertility of the soil, soon revive a succulent plant like the mulberry. The Chinese seem very particular in stirring up the earth amongst the roots of the bushes, immediately after the young branches and leaves have been taken off, and the plantations appear to have great attention paid to them." The worms are commonly kept in dark rooms, fitted up with shelves, placed one above another, from the ground to the roof of the house; and they are kept and fed in round bamboo sieves, placed upon these shelves, so that any one of the sieves may be taken out and examined at pleasure. The silk farms, like all other Chinese farms, are small, and are generally worked by the family and relations of the farmer, who not only plant, graft, and cultivate the mulberry, but also gather the leaves, feed the silkworms, and wind the silk off the cocoons.

Of all the provinces of China, those in which the tea-plant grows are the most guarded against the visits of foreigners; and so indispensable do the natives believe tea to be to the "red-bristled barbarians," that during the late war, when our ships were "careering madly in the Celestial waters," the Emperor proposed to annihilate us at once by stopping the export of tea and rhubarb! Sir John Davis has given us a full account of the different kinds of tea manufactured in China, but Mr Fortune is the only writer who gives an accurate eyewitness description of the cultivation of the tea-plant. The districts where it is reared must always have a rich soil, for the continual gathering of their leaves is very detrimental to the health of the shrubs, and in fact ultimately kills them. Hence a principal object with the grower is to keep his bushes in as robust health as possible; and this cannot be done if the soil be poor. In the great tea plantations in Fokien and Che-kiang, the soil is a rich sandy loam, always situated on the lower and most fertile sides of the hills, and never on the low lands. The shrubs are planted in rows about four feet apart, with about the same distance between each row, and look at a distance like little shrubberies of evergreens. The first gathering takes place just when the leaf-buds begin to unfold themselves in early spring, and

this tea is scarce and of very superior quality. The second gathering, about three weeks after the first, produces the principal crop of the season; the third crop is coarse and inferior, and is said to be rarely sent out of the district where it is produced. "In the harvest seasons, the natives are seen in little groups on the side of every hill, when the weather is dry, engaged in gathering the tea-leaves. They do not seem very particular in this operation, but strip the leaves off rapidly and promiscuously, and throw them into round baskets, made for the purpose out of split bamboo or rattan. In the beginning of May, when the principal gathering takes place, the young seed-vessels are about as large as peas. These are also stripped off and dried with the leaves; and it is these seed-vessels which we often see in our tea, and which have some slight resemblance to young capers." When a sufficient quantity of leaves is gathered, they are carried home to the cottage or barn, where the operation of drying is performed by carefully applied fire-heat and exposure to the air.

Black tea and green are produced from the same plant; those of the north from the *Thea viridis*, those of the south, around Canton, from the *Thea bohea*—a coarser kind, perhaps from growing on a much inferior soil. The only difference between the black and the green teas is in their preparation; they are both made from the same leaves, and not, as the *Physical Atlas* asserts, from leaves pulled at different ages. Mr Fortune is the first who has cleared up all mystery on this point. The black teas are rendered darker in colour, firstly, by being longer exposed to the air in a soft and moist state; secondly, by being subjected to a greater amount of fire-heat. The green teas have their colour artificially heightened ere they reach us. Those used by the Chinese are of the genuine colour acquired in the drying; but those "blooming" kinds, prepared to suit the depraved tastes of the English and Americans, are, one and all, *dyed;*—and "the Chinese, I doubt not," says Mr Fortune, "could substitute for that colour either red or yellow, should our taste change and lead us to prefer more glaring tints!" The dye used for this purpose in the Canton manufactories is a compound of gypsum and Prussian blue. The former ingredient is innocuous; but the latter, being a combination of prussic acid with iron, is a poison; and we only escape its deleterious effects from the colouring matter existing in a small proportion to the leaf. We may mention, in conclusion, that tea, in China, is taken without either milk or sugar. Neither is there any separate infusion, as with us: a few leaves are put into a cup, boiling water is poured upon them, and the beverage is forthwith drunk. The tea in use among the common people is generally of a coarse kind; but some sorts of the prepared leaf are so rare, so delicious, and so highly prized, that they are put up in small packets, and sent as presents to their friends by the higher classes.

To complete our picture of Chinese agriculture, we add a few

sentences on the country in the neighbourhood of Canton,—the most southerly, and consequently the hottest part of the empire, but by no means possessed of a fertile soil. Large quantities of rice are grown, both on the islands formed by the Canton river, and on the flats on the mainland. These rice-grounds can be overflowed at will, the tide being kept out by embankments; and these embankments are not allowed to lie idle, but are made to produce crops of plantains. When the land is too high to be flooded by the tide, the water-wheel is brought into play, and "it is perfectly astonishing how much water can be raised by this simple contrivance in a very short space of time." Sugar is also grown rather extensively near Whampoa, (some twelve miles below Canton,) and in its raw state is in great demand amongst the Chinese. It is manufactured into sugar-candy and brown sugar, but our loaf kind does not seem to be made in any part of the country. On the sides of the river, both above and below the city, large quantities of the water-lily, or lotus, are enclosed by embankments in the same manner as the rice-fields. This plant is cultivated both as an ornament, and for the root, which is brought in large quantities to the markets of Canton, and of which the Chinese are remarkably fond. In the summer and autumn months, when in flower, the lotus-fields have a gay and striking appearance; but at other seasons, the decayed leaves and flowers, and the stagnant and dirty water, are not at all ornamental to the houses which they surround.

The Chinese are a flower-loving nation. The Mandarins and higher classes take great pride in their gardens; floral ornaments are in demand on all festive occasions, and the trade in them is considerable,—some beautiful plants, which grow only in the north, such as the tree-pæony, being brought several hundred miles by sea to the market of Canton. The ladies of Foo-Chow-foo are particularly fond of flowers—artificial as well as natural—for the decoration of their hair. The rustic beauty employs the more large and gaudy, such as the red hibiscus; while the refined damsels prefer the jasmine, tuberose, and others of that description; and artificial flowers are in still greater request. It is at New-Year that the national predilection for flowers is most conspicuous. Mr Fortune, who witnessed the festivities during this season at Canton, says, that not only are the houses and temples decorated with them, but the thousand boats on the river also come in for a most extensive share. Indeed these "flower-boats," as they are called, are only floating-houses—for a very great part of the population of Canton live upon the river; and at all seasons plants and flowers are to be seen blooming on their high sterns, or in their little parlours where their families congregate. "In going up the river at New-Year time," says Mr Fortune, "towards the Fatee Gardens, I met boats in great numbers, loaded with branches [illegible] and plum trees in bloom, enkianthus, camellias, cocks-

nbs, magnolias, and various other plants which flower at this son."* The branches of the eukianthus are brought down from hills with the buds just expanding, and on being placed in water, y very soon bloom in the houses, and remain for more than a tnight as fresh and beautiful as if they had been taken up with ir roots in the most careful manner. The common jonquil, too, nes in for a large share of patronage; and in the streets of nton one meets with thousands of bulbs growing in small pans ongst water and a few white stones. In this case the Chinese ibit their peculiar propensity for dwarf and monstrous growth, planting the bulbs upside down, and making the plants assume ious twisted forms, which appear to be so agreeable to the eye Chinaman. Large quantities of all the above-mentioned flowers exposed for sale in many of the shops and at the corners of the eets in Canton, where they seem to be eagerly bought up by the inese. At the New-Year season, large parties are made to go the gardens at Fa-tee, some three miles above Canton, and particular days you find there hundreds of "flower-boats," wded with young Chinese of the better classes, enjoying themves as our own population do at Richmond or Hampton Court. ese celebrated Fa-tee Gardens (or "the Flowery Land," as the ne implies) are about a dozen in number, and in spring they sent a gorgeous appearance. "They are then gay with the e-pæony, azalias, camellias, roses, and various other plants. e azalias are splendid," says Mr Fortune, "and reminded me of exhibitions of the Horticultural Society at Chiswick, but the -tee exhibitions were on a much larger scale. Every garden one mass of bloom; and the different colours of red, white, and ple, blended together, had a most beautiful and imposing effect." arf-trees, trained into the most grotesque and curious forms, upy a principal place in these gardens, as also chrysanthemums pet flower with Chinese gardeners, and which they manage remely well, perhaps better than they do any other plant.

)rnamental gardening has long been cultivated among the Chie, and the following is a specimen of it which Mr Fortune saw visiting a retired Mandarin at Ningpo:—

oth his house and garden are unique in their way, but they are most difficult escribe, and must be seen to be appreciated. In this part of the country the ding of artificial rockery is so well understood that the resemblance to nature is ect, and it forms a principal feature in every garden. This old gentleman has different parts of his house joined together by rude-looking caverns, and what at sight appears to be a subterraneous passage, leading from room to room, through ch the visitor passes to the garden, which lies behind the house. The small ts, of which a glimpse is caught in passing through, are fitted up with this rockk; dwarf trees are planted here and there in various places, and creepers hang n naturally and gracefully, until their ends touch the little ponds of water which always placed in front of the rockwork. These small places being passed, we are in led through passages like those already noticed; when the garden, with its rf trees, vases, rockwork, ornamental windows, and beautiful flowering shrubs, is

* The Chinese year begins about the middle of February.

suddenly opened to the view. It must be understood, however, that all which I have now described is very limited in extent; but the most is made of it by windings and glimpses through rockwork, and arches in the walls, as well as by hiding the boundary with a mass of shrubs and trees.

The dwarfed trees of China are a curious example of the patience and ingenuity of this people. "Some of the specimens are only a few inches high, and yet seem hoary with age. Not only are they trained to represent old trees in miniature, but some are made to resemble the fashionable pagodas of the country, and others different kinds of animals, amongst which the deer seems to be the favourite. Junipers are generally chosen for the latter purpose, as they can be the more readily bent into the desired form; the eyes and tongue are added afterwards, and the representation altogether is really good."[§] The pretty little plant, Lycopodium, which often naturally takes the very form of a dwarf tree in miniature, is a great favourite with Chinese gardeners; and on Mr Fortune once asking them the cause of their admiration—"Oh!" they exclaimed in Canton English—"oh! he too muchia handsome! He grow only a leete and a leete every year; and suppose he be one hundred year oula, he only so high,"—holding up their hands an inch or two higher than the plant. The process of dwarfing is mainly founded on the principle that anything which stints the formation of the sap, or retards its free circulation, also impedes the formation of wood and leaves. But the first step in the process is said to be, to select the very smallest seeds from the smallest plants; next, the seedlings (or cuttings) are put into pots narrow and shallow, and get no more water than what barely suffices to keep them alive. While the branches are forming, they are tied down and twisted in various ways: the points of the leaders and strong growing ones are generally nipped out; and every means taken to discourage the production of young shoots of any degree of vigour. Sometimes, as in the case of peach or plum trees, which are often thus dwarfed, the plants are thrown into a flowering state; and then, as they flower freely year after year, they have little inclination to make vigorous growth. Whatever may be thought of the taste which dictates the rearing of such curious monstrosities, it is sufficiently evident that the process exhibits much ingenuity, and no little practical acquaintance with the physiology of vegetable life.

Such is a picture of the system of agriculture practised now, and for ages past, in the great empire of China. In forming any general estimate of its condition, there will doubtless be some variety of opinion, and we leave that to the judgment of our readers; but we cannot omit to eulogise the general and cheerful industry of the people. They never fail to seize the proper season and weather for their farming operations; they take every advantage of their summer time by the system of double cropping, and in general may be said to make more of their land than perhaps any other nation. If their agricultural knowledge cannot vie with ours in science, it is

at least infinitely more widely diffused: the system, as we have described it, is known to, and practised by every cottar in the empire. Drilling in sowing, and the steeping of seeds, are practised, and have been long known to them; and in the two important matters of manures and irrigation, they are unsurpassed, perhaps unrivalled, by any nation in the world.

Agriculture in China has been from time immemorial fostered by the Government as peculiarly the national pursuit, and it has well repaid the imperial patronage. In a country nearly as large as all Europe, and far more densely peopled—containing, in fact, more than a third of the whole human race—the population live more comfortably than any other nation on the globe. No emigration has issued from its shores—no myriads have been exiled, in order to make room for others at home; yet never has there been a superfluity of labour, or a deficiency of food. Constantly and rapidly increasing in population, each new myriad has been a fresh increase to the power and resources of the State; while the invidious extremes of poverty and riches (that bane of all other old States) is there unknown, and wealth is more equally divided than in any civilised country. Undisturbed in their little farms, the people are contented and happy; and with comparatively little commerce, and no manufactures, (viewed as a separate employment,) the empire has continued for long centuries in peaceful prosperity. There the home consumers have ever maintained the home producers in prosperity: the only opening of new markets has been found in the increase of the population—the only emigration has been to the hill-side and the marsh. Sismondi, the great French historian and philosopher, declares that the real bone and muscle of a nation is its agricultural population, and recently predicted the coming ruin of the older States of Europe from the evident decline of this class of their people.* This opinion of the Western sage finds a remarkable corroboration in the remote East; and the voice of three thousand years' experience, wafted to us from the distant shores of China, combines with nearer evidence to make us uphold agriculture as the healthiest, happiest, and most natural of all national pursuits.

* A different state of things is now springing up on the Continent; and our own statesmen might take a hint from the following facts, which are likewise applicable to many parts of Prussia and the Rhine provinces. "In Saxon Switzerland," says Mr Kay, "the Government of Saxony possessed a number of barren heath-clad hills which had never been brought into cultivation, and which, by many persons, were supposed to be quite unfit for cultivation. The Government gave notice, a few years ago, that it would grant portions of the sides of these hills to any person who would cultivate them, on the following conditions:—For three years no rent was to be paid for it; afterwards the cultivator might either purchase the land at a certain rate fixed and specified, or he might rent it from Government at a small annual payment, the amount of which was to bear a certain fixed proportion to the produce obtained from the land. The scheme has succeeded admirably. Whole hill-sides have been taken by peasants, and brought into cultivation. The moorlands have been drained; the stones have been carried away; the land has been well trenched, and has become very valuable." This is a novel system in Europe, but a very old one in China.

ON DRAINING STRONG CLAY SOILS.

The strongest proof of the importance attached to draining, and the difficulties with which the subject is beset, is the keen discussion it has now for many years excited. Much of the misunderstanding this dispute has produced has, undoubtedly, arisen from the difficulty of properly defining the subject. However, by confining our remarks to strong clays, much of this difficulty is at once got over, as no description could bring the soils to which we refer more clearly before the farmer's eye than the simple words, "*strong clay soils.*"

The importance of removing superfluous water from the soil is so universally admitted, that no arguments are now requisite to convince both landowner and tenant of the necessity of effecting this first of all improvements. But as draining requires a very serious outlay, it is also of the highest importance to know the best and cheapest methods of carrying it out.

The period of the rotation when draining can best be done, is the first question which arises; and as a general rule the fallow is undoubtedly the most convenient opportunity, and the earlier in the winter the better. If these precautions be neglected, the following crops are almost sure to suffer from the large quantity of clay thrown out in cutting the drains.

The tools used in draining are too well known to need a lengthened description. Some portion of the work of cutting drains has at various times been attempted with ploughs of different forms and constructions; but "being very limited in their opportunities of employment, and utterly inefficient unless the soil is entirely free from stones, and in the proper state of moisture," no reference to them is necessary. The common plough saves a little cutting in furrow-draining, and also fills in the drains very effectually. Very little more than this can be done by any of the draining-ploughs, properly so called, except under very favourable circumstances.

The mole plough has occasionally been found useful on grass land, but its utility upon tillage land is very problematical; and, as tiles are so cheap, few will now advocate its application.

Not only has the draining-tile superseded the mole plough, but all the old plans are likewise nearly abandoned; though, as there are occasionally situations in which stones or turf drains may be useful, they deserve some notice.

1st, *Stones* are not often quarried expressly for drains, but are more frequently obtained by digging them out of the land, where they happen to be so near the surface as to interfere with the plough. Where stones large enough for that purpose can be procured, a conduit is always built. Instead of this conduit, drains

are, however, sometimes filled up with rubble stones, the refuse of a quarry, or those gathered off the land or out of the bed of a stream. The stone conduit drain is too expensive for furrow-draining, but the latter make most efficient drains on grass land —the only place we have seen them tried.

2d, Thorns, straw, and suchlike, are still occasionally recommended as a substitute for even the rubble stones; but there are very few situations in which the extra expense of laying a tile-drain, when the drain is once cut, will not be amply repaid in the superior efficiency and permanency of the work.

3d, A very efficient drain, differing from those above described, has now been at work about twelve years on the writer's own farm. The drain is cut with the usual tools to within nine inches of its intended depth; one spit more was then taken out with a narrow triangular spade, leaving a shoulder at each side of the drain on which the sod taken off the surface was laid. The main drain was laid with the usual tiles.

4th, It now only remains to describe the draining-tile as undoubtedly the best of all the means yet devised for the drainage of strong clays. Indeed, without the draining-tile, combining, as it does, cheapness and light carriage with efficiency, furrow-draining, as now practised, would have been impossible. Many proprietors, with a laudable anxiety to supply their own estates, have, however, committed the serious evil of working up an unsuitable clay. Many a drain has, by this short-sighted economy, been rendered worse than useless.

The shape and size of the tile to be used is the first consideration; and, like everything else connected with the subject, they have both been keenly discussed. The horse-shoe tile gives a larger conduit, for the weight of clay, than any other; but it should never be used without soles, or with very wide flanges. Pipe-tiles afford the best security against silting up—a most important recommendation; and, if made with a slight flange, or soles be used when the ground is soft, there does not seem to be anything left to wish for. Oval pipe-tiles are objectionable, as giving a smaller conduit in proportion to the weight of clay than even the pipe-tile does. With regard to size, the writer would be afraid to trust anything smaller than a three-inch pipe for furrow drains, and a larger size for the main drains. The one-inch pipe has now few advocates.

Before proceeding to drain a field, it is necessary, first, to ascertain from what source the excessive moisture we seek to remove arises. It may either be from under water, as springs, or from the stagnation of rain water upon an impervious subsoil.

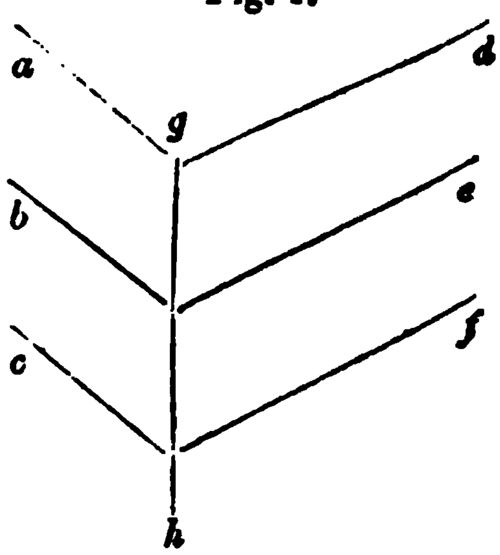
This distinction is an important one, as, in their enthusiastic admiration of the new system, many seem to have forgotten the method by which Elkington worked such wonders.

The "*stagnation of rain water upon an impervious subsoil*" is an

evil from which all strong clays suffer more or less; but there are few fields on this kind of soil which are not also suffering from spring water. Each soil may, and mostly does, require a different course of proceeding for its removal; and in nothing is a mature judgment on the part of the drainer more shown than in a judicious combination of furrow drains with Elkington's method.

As we hold the removal of spring water to be the first step, we will consider—1st, *The drainage of land which is rendered wet by spring or under water.* This is a branch of the subject which applies to every description of soil, as well as "strong clays;" and our remarks will be best understood if the cause of this evil be examined. The first case to which we will refer is one where the outbursts of the springs, as indicated by the damp state of the land, and by the poor crops, are at some distance apart, or where perhaps only one such spring occurs in a field. Such springs occur where the water is thrown out at the outcrop of the impervious beds of clay, which alternate with beds of sand or gravel. The consequence of this is a line of springs across the field at this point, or a general wetness over the whole, according to the distance apart of the points of the beds of clay. The plan we would recommend in this instance is to run the drains across the hill, at a short distance above the outcrop of the clay; but the solid substratum of clay *must be reached, or the draining will be imperfect.* A case in point occurred on the writer's own farm. There were three of these lines of springs in a 10 acre field, and three lines of drains, *a*, *b*, *c*, and *d*, *e*, *f*, fig. 1, were run across the hill a little above where the water appeared, the main drain, *g*, *h*, being run up the field. They were cut 4 feet deep, and 20 yards apart, and have quite removed the spring water.

Fig. 1.



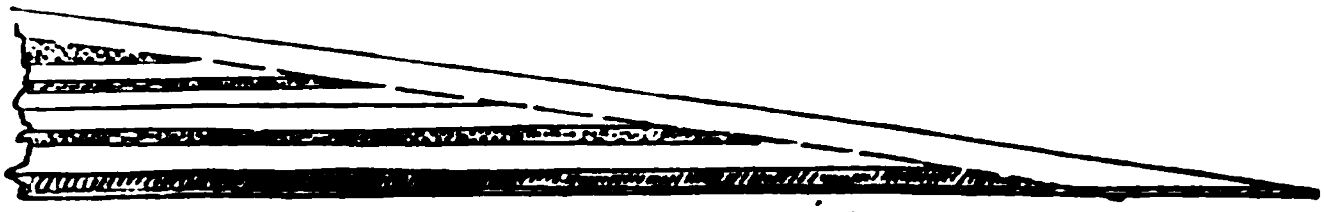
When a portion of a field is observed to remain black or wet in the spring, after the other parts are dry, it is a sure proof of the existence of spring water; so when, after the drains have been put in, the whole of the field is observed to be of a similar degree of dryness at the same time, we may conclude that the springs have been removed.

Much of the evil we are here describing has been removed since the time of Elkington, but there is yet many a broad acre suffering from spring water; and our motive for here noticing this part of the subject is, to insist upon the importance of first removing the spring water before attempting to furrow-drain for surface water, as the cases are extremely rare, especially upon strong clays, where the same drain will answer both purposes.

The next case we shall describe is one in which the wetness or

moisture is so evenly spread over the surface of the field, that it may readily be mistaken for a case requiring drainage for the removal of stagnant surface water. But if any doubt exists as to the source of the superabundant moisture, it is at once set at rest by water springing out of the bottom of the drains as soon as they are cut. In this instance the layers of sand or gravel are only a few feet apart; or perhaps the clay contains minute layers of sand, through the crevices of which the water rises to the surface. The soil resulting from this mixture, approaches in character to the intermediate class of soils between strong clays and turnip soils; but as there are few strong clay farms which have not, in some corner, a field of this description, it very properly comes under our notice. When the subsoil is of the character shown in Fig. 2, the evil is

Fig. 2.



much more serious than in the previous instance. In draining a field of this kind, it is impossible to follow out the rule laid down for the first example, namely, that "the drains must be cut to the bottom of the water;" and as this cannot be done, they must be put in much more closely: twenty yards apart, which was quite effectual in the one case, is here useless. And on referring to Fig. 2, it will be observed that a drain cut up to the slope will tap every strata at its outcrop, thus indicating the direction of the drain to be up the hill, not across it, as in the first example.

In a field of such a character as would be the result of a mixture of sand and clay, as shown in Fig. 2, some practical men recommend the drains to be placed at forty feet apart; but this is more than can be depended on to dry effectually. Thirty feet is nearer the proper distance, and the drains should not be less than three feet deep, and need not exceed four.

2d, *The drainage of land which is rendered wet by the stagnation of rain water.* This is the most extensive branch of the subject; for, whilst our previous remarks apply only to insulated fields, or portions of fields, we may slightly modify the language of the author of *The Book of the Farm*, and assert that not a single "strong clay farm exists which would not be much the better for furrow-draining." Entertaining this opinion as strongly as Mr Stephens * does, we would urge the practice of draining with much earnestness; and, as he well remarks, "deep drains are not," as in the cases already alluded to, "required, but rather plenty of them, to allow the water an opportunity to escape." The first question therefore is, *the depth at which furrow drains should be placed so as to secure the removal of stagnant surface water.*

* See Stephens' *Manual of Practical Draining.*

This question at once throws us into the thick of the discussion, which has now been going on for many years; and it is one to which no satisfactory answer could have been given, had this essay not been confined to strong clays, as every description of soil and subsoil requires a different depth of drain. Even upon strong clay soils, every depth between four feet and twenty inches has had its advocate. In the midst of such a diversity of opinions, it is some satisfaction to find Mr B. Webster, in the Journal of the Agricultural Society of England, advocating exactly the depth which we have found to be the most advantageous. Mr Webster, in the paper referred to, mentions several instances of the failure of drains in strong clays: one reason for this failure he conjectures to have been that the drains had been put in too deep. As the result of a careful examination of the subject, he expresses an opinion in which we cordially agree, that thirty inches is the extreme depth for drains in clay soils. In the same paper, a letter from a gentleman in the neighbourhood of Newcastle (where there is a great extent of the soils on which we are treating) is quoted, also stating thirty inches to be the least depth.

Many similar opinions are mentioned by Mr Webster; and in answer to those who would advocate a still deeper drain, it is some satisfaction to be able to add the expressed opinion of Mr Elkington, the father of deep draining. No one could be more an advocate for going deep for springs; but with regard to trying the same plan, in surface-draining strong clays, he says—"In soils that are so tenacious as to retain water on the surface, this method of draining deep has been tried, and found entirely to fail." The object of this and the other authorities quoted, is to strengthen the opinion we venture to express on this disputed part of the subject. The cases are extremely rare in which we would recommend 36 inches, and few will now advocate less than 24 * to 30 inches. Between these extremes, the judgment of the drainer must be exercised according to the nature of the soil and subsoil.

The next question is *the distance apart at which the drains should be placed.* This part of the subject has excited as keen a discussion as the depth of the drains has done. Independent of any difficulty that might be experienced of determining the proper distance apart, when the inquiry is confined to a fixed relative depth upon a known description of soil, as those to which this essay refers, the question has become still more complicated by the opinion so prevalently entertained, that, the deeper the drains, the wider they might be placed apart. In the paper, by Mr Webster, from which we have already quoted, there is a remark which decides this point effectually. Mr Webster says that "a railway cutting, 18 feet deep, running through his farm, drains no more land on each side than

* Twenty-four inches will not safely admit of deep ploughing.—Ed.

a drain 3 feet deep does." From this it appears that, if the proper depth be once decided, there is no advantage gained by increasing the depth, with the hope that by this means the drains may be placed wider apart.

We have been very much surprised to observe a field, where the ridges were of the high old-fashioned kind, once so common, drained for surface water, by running the drains parallel with one of the hedges, without regarding either the size or direction of the old ridges. If a deep cut be made across such a field, it will be observed that both the soil and subsoil have most accurately accommodated themselves to the form given to the ridges by the plough. Suppose a drain to be placed in every alternate furrow of such ridges as we are now describing, the water will most certainly not be drawn out of the intermediate furrow. In this case, the width of the ridges, if even that be only 15 feet, is the distance at which the drains should be placed; and the direction of the ridges, not parallel with one of the hedges, is the direction in which the drains should be placed.

The best drains the writer has ever put in, on his own farm, are in a grass field with high ridges as above described, about 15 feet wide. A drain was put up each furrow 2 feet deep, the top sod was placed over the tile, and the extra expense for cutting, laying, and filling in, was 3d a rood of 7 yards. If straight parallel drains had been set out, they could not have been put so deep into the subsoil for less than 8d. The herbage has quite changed since the drains were put in, all the coarse grasses which previously covered the furrows having entirely disappeared.

Such cases as the above high old-fashioned ridges being now comparatively rare, we will turn our attention to strong clay soils, as they are commonly tilled in 9, 10, 11, or 12 feet ridges. Upon these soils every width of drains, between 20 feet and 40 feet, has been advocated. Where the ridges are 10 feet wide, every alternate furrow is the proper situation for the drain. Where they are 12 feet wide, 24 feet is the extreme distance apart at which the drains can be depended on to do their work satisfactorily; and upon 16 to 18 feet ridges, there is no alternative but to put a drain up every furrow upon strong clay soils. These rules admit of some modification, as even in strong clays there is a sufficient diversity of character to leave something to the judgment of the drainer. To those who object to such close draining on the score of expense, we reply, that, if land be worth draining at all, it is well worth draining effectually.

Until we saw the field to which we have already referred, where parallel drains were set out regardless of the direction of the old ridges, we had hoped that the question with regard to the direction in which furrow drains should be run had been quiet settled—namely, that they should be run in the direction of the ridges. If

this be correct, with regard to the ordinary 10 foot ridges, it is much more obviously so upon the high old ridges, where the greatest part of the water must, both from the slope of the surface and of the subsoil, find its way into the furrow.

The cultivation of strong clays after draining comes next under our notice. A few years ago, the subsoil-plough was much advocated, some even subsoiling their fields before draining. As might have been expected from such indiscriminate use of a really valuable implement, it has fallen into disfavour. The good effects of the subsoil-plough, even upon drained land, do not, however, last longer than eight or ten years. It is the practice of some farmers to lay their fields quite flat after they are drained, others *gather* the ridges into 20 or 30 feet breadths. Every farmer knows the difficulty of keeping such ridges in a proper rounded form, both of these two extreme practices should therefore be avoided. The best plan seems to be to gather the ridges into 10 or 12 feet widths, when the drains are 20 or 24 feet apart, but keeping them as flat as possible. Where the drains are only 15 feet apart, the furrows should be above the drains; but on no account should strong clay soils ever be laid flat.

A few years ago, a gentleman largely interested in draining operations said, that nothing but the expense prevented him from covering the draining tiles with sheet lead. It is difficult to understand what advantage was to be gained by this process, and it is equally difficult to understand why so many drainers have so strenuously advocated the putting in of clay upon the top of the drains. It seems as if they wished to return the field to as nearly as possible the same state as that in which they found it. In making such an assertion as this, it is some satisfaction to be able again to quote from Mr Webster's paper, so often referred to. "A proof," says that gentleman, "of the obstinacy with which strong clays will retain moisture near their surface, may be seen near Warwick. There draining is required, although the subsoil, at a depth of little more than 4 feet, is a dry sandstone." A section is as follows:—

Soil, 1 foot 3 inches.

Clay, 3 feet.

Dry sandstone.

"If water will freely percolate through 4 feet of stiff clay to reach a line of pipes 30 or 40 feet apart," as the advocates for filling the clay in upon the top of the pipe say it will, "how is it that it will not reach an absorbent material, like dry sandstone, spread underneath the whole surface?" The answer to this very pertinent query is, that if it will not reach the sandstone spread underneath the entire surface of the clay, it certainly will not reach the pipes through 4 feet of stiff clay.

The best drains the writer has ever seen are at Seghill Colliery,

near Newcastle: they are put in 3 feet deep, and 15 to 20 feet apart, according to the nature of the soil and size of the old ridges. Upon the top of the tiles is placed a good cover of splint coal, about a cartload to 15 yards; upon the top of this the surface soil is filled in. Such drains are, indeed, a permanent improvement; and we would recommend an inspection of them to those landowners who are able and willing to follow such an example. To those who hesitate at such an expense, we would recommend that the clay cut out of the drains be spread over the surface, and the drain then filled in with the surface soil from each side. This is very easily done with the common plough, the horses being yoked by a longer swing-tree than usual, and going one on each side of the furrow. Except to fill in the main drains, no spade-work is then necessary.

Wherever such an arrangement is possible, let the entire drainage of a field be discharged at one mouth, both for the purpose of securing a good scour through the main drain, and also because the drains being very apt to be injured if the mouth be not kept clear, as well as by the entry of moles, rats, &c., the fewer outlets the farmer has to attend to the better. Where the quantity of water to be discharged is very large, a single pipe of sufficient size to contain the whole is very expensive. In this case a most efficient conduit may be formed by laying one of the horse-shoe tiles on its back, and another in the usual position upon it. This makes a much better conduit than placing the same tiles side by side.*

The following are estimates of the expense of draining an acre of land by the different plans above described:—

1. *Furrow-draining* 30 *inches deep and* 20 *feet apart.*

102 roods of furrow drains, at 5d.,	£2	2	6
10 ... of main drains, at 8d.,	0	6	8
Do., filling in with the spade,	0	0	10
2000 tiles for furrow drains, at 16s.,	1	12	0
200 ... for main drains, at 24s.,	0	5	0
Cartage, say	0	10	0
	£4	17	0

2. *Turf Drains at the same distance apart.*

Cutting same as above,	£2	9	2
Tiles for main drains,	0	5	0
Laying the sod and filling in, at 2d. per rood of 7 yards,	0	18	6
	£3	12	8

* Excepting with broad flanges, two tiles thus set with their edges upon one another, the upper one will be apt to slip down into the lower, without the inter-insertion of a sole tile.—Ed.

3. *The Rubble-stone Drains.*

112 roods of drains, at 6d., for cutting, laying, and filling in, ...
Cartage of 112 loads of stones, at 6d., . .

4. *Stone Drains.*

Cutting, say 4 feet, . . from 1s. 4d. to
Laying, ... 2d. per ro

The filling-in will cost about 1d. per rood, and per acre will vary with the number of roods requir the stones, &c. Fields are now rarely furrow stones. Tile drains are generally laid for the pric though some drainers, we think properly, prefer emp workman by the day to do this important part of this case, with a boy to hand him the tiles, a man fifty roods per day.

Recent acts of Parliament, by enabling the own estates to charge the property with the outlay for removed a very serious obstacle in the way of drainage. When so little was done by owners of en before they obtained the security and assistance o we may well be surprised at so much having been d of draining by tenant-farmers. So thoroughly con latter of the importance of draining, that nothing leases, or compensation for unexhausted improve still greater impetus to its extension. A great ext been drained by the farmer contributing one-half This we think most unwise on his part, as his occupan be worth more than ten years' purchase at the utmo of even an entailed estate must be a very old man in the drained land be not worth more. The ques is the tenant's interest to do must of course vary wi for draining. But we think the proper plan is for th find the capital, and the tenant to pay a percentage are rare where the latter is justified in paying n cent.

THE FARMER'S NOTE-BOOK.—No. XXX.

Notes on American Agriculture.—In the conclud our paper, at page 418, we offered a few remarks generally adopted in preparing uncleared or woode first proceedings of an emigrant settler on arriving at We have now to give a few additional "notes" on part of our subject.

In cutting down the trees, care is taken to see how they are going to fall: a neglect of this precaution is often the cause of loss of life or limb. It is a strange thing to see the huge-limbed sturdy sons of the forest yield to the power of man; to have the deep silence of the woods broken by the sharp strokes of the well-directed axe and the sound of crashing timber. "They have lived and reigned from creation, these lords of the forest, but they must now bow to lordlier man." In some cases, in place of chopping them down at once, "girdling" is resorted to. This consists in cutting away the bark in a strip some few inches in breadth, and at a few feet from the ground. This prevents the upward circulation of the sap, and the trees rot and fall. In firing timber, care is taken to leave a space around fully cleared, to prevent the adjoining trees from catching fire. Frequently from carelessness in this particular, acres upon acres of wood are entirely consumed. At such times, the appearance of the wood at night is truly sublime. During the day, a thick dense smoke envelopes all the burning mass, which remains like a pall stretched above, save now and then the flame bursts upward—not seen in the glare of the day, but known from the smoke momentarily clearing up. But at night it is in all its beauty. Here and there the blackened stems peer out from amidst the livid flame—one moment free from all contact with it, the next enveloped in a blaze which seems to spring from every pore. The crackling of the branches—the whizzing of the flame—the shower of sparks, dashed upwards and around by the force of the falling trees—the roar, like a multitude of huge furnaces—the wind rushing strongly from all quarters to feed the flame—all tend to make the spectacle of the "grand old woods" on fire one of no ordinary interest. In dry weather, all attempts to extinguish the fire are futile; and clump after clump of trees are taken in, herds of animals are consumed, and too often, alas! the homestead of some poor settler swallowed up by the devouring element. In such cases, the loss of life and property is considerable. There is reason to believe that every year, in the woods of the American continent, many unfortunate individuals are lost in fires occasioned in the manner we have shown, or by the Indians. Such wide-spread devastation, thus occasioned, is unfortunately not of rare occurence. On the point of leaving that land some months ago, the news reached the port of embarkation of a fearful fire in the western states, which had lasted for days, and ravaged large tracts of land, consuming everything before it. Such is one of the incidental dangers of a backwood settler in America.

The ashes from the trees consumed are either spread upon the land or sold to make potashes of. For the latter purpose there was formerly a great demand; now, from improvements in chemistry, it has fallen off considerably. It, however, may still bring

some five or six cents per bushel. The ashes from hard-timbered trees make the best potashes. Should the emigrant require planks, if a saw-mill is near his location, the proprietor will gladly exchange them for trees. This custom is a great convenience to original settlers. In almost every lot of uncleared land there are numerous maple trees. These are generally reserved for making sugar. The process is largely carried on in American farms. In some seasons, not only is sufficient made for family purposes to last throughout the year, but sundry quantities left for market. The first preliminary operation in the manufacture is the making of the trough for receiving the highly saccharine sap. These are scraped out from short rough pieces of timber. Often in walking through the woods have we stumbled upon one of those rough, Robinson Crusoe looking utensils, left there from the previous winter.

Selecting a morning succeeding a clear frosty night, in the month of February or March, the family sally out to the woods, the little sledges bearing the kettles and other appliances. A space is cleared from snow, on which to make the fire for evaporating the sap. The trees are tapped with an axe or auger a few inches from the ground, and a pipe inserted in the incision to lead the sap to the trough below, placed on the ground to receive it. The contents of the trough are poured into a large iron boiler, suspended over a huge wood fire. The sap is then boiled till it is considerably reduced in quantity. More is then added, great care at this stage of the operation being taken to skim it. The boiling is continued till it forms a thick consistent syrup, and latterly sugar. It is then ladled into small open pans; and on cooling, it has all the appearance of hard brown sugar. As there is little to do on farms in the winter months, sugar-making in the northern states will pay well when the members of the family are employed in the operation, but not when extra labour is hired. Sugar-makings are sometimes the occasion of "grand frolics;" the lads and lasses from the neighbouring hamlets assisting first in the process, then, after work is done, having a dance and other amusements. Indeed, this habit of gaining help on extra occasions is largely kept up in America. Thus, when the Indian corn is to be freed from its husks, a "husking bee," or frolic, is got up by the farmer requiring assistance; and much fun and jollity there is on these occasions —the otherwise hard work being rendered almost a matter of amusement. In like manner, when the "gudewife" wishes her "quilts" for the winter bedding made, the talents of the young ladies—there are no young *women* even in a farm-house in America —are called into requisition; and due notice of the affair being given in the adjoining hamlets, the young men drop in, as it were, accidentally in the latter part of the day; and at the "quilting frolic" much fun prevails. There is much wisdom shown in these customs. Labour being very dear, by this plan the expense of

hiring it is saved; and much work, agreeably interlarded with a little sport, is got for nothing, save the expense of food—" the chicken fixins and uncommon doins." Upon the whole, there is much pleasant life at a Yankee farm; and, judging from personal experience, all seem to have a decided partiality for it.

After clearing and fencing the land to be cultivated, the settler gives his next attention to the " fixin " of his garden. This is of importance, as he can easily raise vegetables enough for his family use. His pigs are allowed to roam the woods " fancy free," the attractions of a home being retained in their memories by a judicious outlay, in the evenings, of a little corn and the slops of the house. The " crummy " is allowed the same latitude of range: her calf, being housed, will bring her home regularly in the evening, till she becomes accustomed to the practice, when no extra inducement is required. We have before mentioned that the gates are often rudely constructed, consisting of a few spars inserted in holes made in the posts at either side. When cattle are removed from one place to another, one or two of the top rails are removed; and to save further trouble in this respect, the cows are made to leap the remaining ones: thus they soon acquire a bad habit of leaping. To prevent their doing this when pastured in *enclosed* fields, or when grazing at the roadside, or in the woods to prevent their entering other property by leaping the fences, it is no uncommon thing to see them with wooden hoops fastened round their necks. In cases where cattle are found straying on other property, they are returned to their owner on his paying expenses. Far west the love of litigation is strongly implanted in the settlers. Such an occurrence as we have above noticed would very likely bring on a protracted suit, resulting probably in the ruin of both parties. We need scarcely say that this feeling, so long kept up for interested motives by a perfect host of " 'cute Yankee lawyers" —with which the western states were much infested—is now dying fast away.

The emigrant settler, if possessed of little capital at first starting on his farm, often hires himself out to others, for day labour, in the spring and summer. After sowing his crops he returns to his labour. By this procedure, a man may find himself at the end of the year a few dollars in pocket from the produce of his labour, and the crop of the few acres he may have cultivated in addition. With this money saved, he can provide himself with many comforts. Thus alternately working on his own little farm, and assisting on others, he finds himself in a much better position than the man who, with a small capital, say of a hundred pounds, works continually on his own land. A party thus working out may also let his land for other parties to crop, either finding the seed, implements, &c., and receiving half the products, or merely giving the use of the land, (the cultivator finding his own seed, &c.,) and

receiving a proportionately less portion of the products. This practice generally obtains in many parts of the western states. This plan of hiring himself out is attended with many advantages to the settler possessed of little capital. He acquires a knowledge of the people, their habits and customs, mode of doing business, and last, though not least, an acquaintance with their peculiarities of farming. In proof of the wisdom of first attaining these before working on his own account, we could cite many instances. One we will give, which will be interesting. A farmer, occupying a hundred and seventy-five acres in a beautiful part of an agricultural state, related his experience to us. He had originally been a small farmer in Dumfriesshire. On arriving in America, pushing at once for the interior, he wisely deemed it the better course to settle in the neighbourhood of a good market, and consequently pitched his tent near a manufacturing village. Totally unacquainted with the district, its people, and their manner of doing business, he did not at once purchase land and commence operations: he quietly waited for a favourable opportunity. Not disdaining to work, he hired himself and family to the cotton mill. His leisure hours he filled up by making acquaintances, wandering about the land, watching their mode of operating, and always on the look out for a "bit of ground." He had not to wait long; he saw, examined, and pitched upon, a piece of land, which he determined to make, some time or other, his own. Canny Scotchman as he was, he did not eagerly hunt after it, or the "'cute Yankee" would have soon raised the price; but apparently quite indifferent as to the whole affair, he got it at his own price, and on remarkably easy terms. And now the acquaintance he had formed, and his knowledge of the Yankee tradesmen, served him in good stead. Judiciously blending the requisite peculiarities of American farming with the improved methods existing in this country, he soon changed into a place of smiling plenty that which, by carelessness and mismanagement, had almost become a second time a wilderness. His farm and dairy produce fast took the market; and he now enjoys, with plenty and comfort surrounding him, the reputation of being the best practical farmer of his district.

We have noticed elsewhere the ease with which cleared land can be obtained in the older portions of the States. Probably there is none in which this can be done so cheaply as in Virginia. We shall again return to this part of our subject—here giving a brief notice of the mode adopted in reclaiming exhausted land, adopted by some farmers. The following is that given by the Rev. Mr Thompson. The land is Virginian, which has been exhausted by raising successive crops of tobacco.

As early as possible, (the winter having been occupied in making manure,) we will plough up five or six acres. With one horse and three cows, we can manure enough for this much land in the course of the winter. How deep we shall plough, will of

rse depend upon the nature of the soil. We shall probably find that it has never n ploughed more than four inches deep, and possibly the under soil may be better n the upper. To do this ploughing, we must borrow a horse of one of our neigh-rs, and lend him ours in return. We will spread the manure as we make it, or it up under cover, and give a second light ploughing in the spring, after the nure has been hauled on. As much land as can well be manured from the stable, be devoted to potatoes and Indian corn ; to the rest, as far as we are able, we give a good coat of marl, or peat, or muck, with as much lime as it will bear. s we will put in with spring rye for soiling, and with oats. If any part of our n appears good enough, without the application of any kind of manure, to take er, we will sow as much as we can. As early in the spring as the ground will k, which will probably be in the latter end of February, we must of course put in potatoes, rye, and oats. About the first or second week in April, we may plant corn. . As we have a small lot, and wish to make the most of it, we will plant it in s three and a half feet apart with the drilling-machine, putting the grains four es apart in the rows. It must be kept clean by ploughing and harrowing between rows, and between the plants with the hand-hoe. If one barrel of guano, one of ster of Paris, and ten of well pulverised peat or muck, could be scattered by a d going before the drill, it would materially assist the crop. When the plants e grown a foot high, we may begin to thin them out to a distance of twelve inches, these plants will serve for food for our horses and cows. We can hitch a horse small truck narrow enough to go between the rows, or to a wheelbarrow. In month of July we will get a piece of ground well manured, and put in half-an- of rutabaga turnips, and with these we can fatten our hogs and beef. When corn is fit to cut, we will clear it off, plough up the ground, give a slight dressing nanure, and then put in wheat ; and if we have any manure left, it can be put, h a coat of lime, on the clover. In this way let us go on for six years, and then pare notes with the man with his "stumpy" farm. The following may be con-red a low estimate of the productiveness and proceeds of such a farm, when thus ught into a fair state of cultivation :—

	dolls.	cts.
15 acres of corn, 750 bushels, at 50 cents,	350	00
10 do. of hay, 2 tons per acre, at 10 dollars,	200	00
3 do. of potatoes, 450 bushels, at 30 cents,	135	00
2 do. of rutabaga, fed to stock.		
5 do. of wheat, 100 bushels, at 1 dollar,	100	00
Cows and hogs,	100	00
	885	00

As a substitute for the rail-fences, the osage, orange, or Machira nt, is used. The thorn hedges do not thrive well in America. e do not remember of ever seeing one, or a tall thorn-tree, in the course of our perambulations, though we were informed it in some places there are trees which would do no dishonour to r rural districts in this country. An enthusiastically national otchman, who had long been located in America, once remarked us, that, in his rural walks, he missed one thing, and that s, as he described it, with a fond remembrance of his dearly-ed national poet, "the milk-white thorn that scents the evening le."* We used frequently to express our astonishment that, idst all the rural flowers, many of which in our rambles we met h, and knew as "old familiar faces," we never came across the onny gem," so dear to all Scotchmen—*the gowan*. The large d, called here horse-gowans, if we recollect aright, grows undantly ; but our searches—and they were many—were never varded by one mountain-daisy, rearing its "white crest and its

* Burns.

gowden e'e," amidst the green herbage of American fields. We will not for many a day forget the look and tone of voice with which our Scotchman told us "there are nae gowans here," and the earnestness with which he besought us, if ever we returned to his adopted land, to bring, somehow or other, a root from some mountain side of his "ain dear native land." Heather, too, we never saw; and, amongst other commissions registered in our "note-book," we, if ever we revisit America, find that we shall have to take a *Wardian case*, filled with roots of heather, amongst our other plants. A Scotchman's nationality never dies; and we have found it as strong in those who have farmed in Yankee land for thirty years as in the emigrant who has made but a five days' residence in his adopted country. We make no apology for offering these remarks. From the nature of our "notes," they must be unconnected and detached; and just as we find any interesting "jotting," we give it—keeping, of course, as much as possible, some connection in our remarks.

In Virginia, the expense of resuscitating the lands is exceedingly slight: a single dressing of marl or lime, followed by clover and gypsum, generally doubles the first crop. Lands thus treated have, under experienced care, produced from thirty-eight to fifty-five bushels of corn, and twenty-four bushels of wheat, which before did not average more than six bushels of wheat per acre, or twelve to fifteen of corn. Land which has never been ploughed deeper than six inches, or dressed with manure, produces as much the first year as pays for the labour of making it thus productive—a good ploughing and a top-dressing of lime or marl being the mode adopted.

In purchasing lands cleared or uncleared in the states adjoining the sea-board, or in those in the interior or in the far west, all due care is requisite. Many parties professing to be land-agents, are the most heartless scoundrels in existence. Some of our readers who are familiar with the writings of Dickens, will, doubtless, remember the graphic description of the one-eyed rascal, a vagabond of this class, in the novel of *Martin Chuzzlewit*. The fellow there described, with his "soft sawder" and stock of lies, may be taken as the type of a numerous class who flourish in America, fattening upon the hard-earned cash of poor emigrants, in whose way they have fallen, and are actuated towards them by the vilest intentions. Judging from experience, the portrait so ably drawn by Dickens was, doubtless, from nature: we came *once* across such a marvellously villanous fellow. The mode in which these fellows do business is of a daring and dashing style. They have emissaries in *this* country, who make it their business to inquire into the intentions of parties about to emigrate. Their names and port of disembarkation are sent over to the head manager in America, who looks out for their arrival, and generally contrives to inveigle them into his net.

If, however, the game is numerous—as, for instance, a number of families travelling together with the intention of joining in the purchase of land, and jointly farming it—a plan adopted very frequently—then it is considered worth while for one of the *missionaries* here to take a passage in the same ship, cross the Atlantic with them, and, making good use of his time, prevails upon them to purchase land where *he* is going to locate. Another plan adopted by these miscreants is the following. It is graphically described by one who knows the working of the system well, and has laboured hard to expose it:—"When the ship arrives at the quarantine ground, you will, perhaps, find that some man has succeeded in smuggling himself on board. He has come all that way in a boat, in purpose to warn *his* friends of some new trick of the runners, or to expose the villany of the emigrant which has just been brought to light. Perhaps you will find him to be some fond husband or lover, and you will witness the rapturous meeting of Mary (a confederate) and her dear Johnny. By-and-by you will hear it rumoured through the ship that John has been telling Mary of his wonderful success in the western country, where he is settled; how he bought land for one dollar an acre; now a town is laid off there, and he is selling his farm for a shilling a foot. Towns, he says, are springing up there like mushrooms, and any one who will go and buy land there can make a fortune." If the bait is taken, the purchaser is done. These fellows keep handsome premises, which they call "land offices." In these they have beautiful maps of the localities where they have lands to sell. These are embellished with no end of fine level lots—watered just in the right places with meandering rivers—rail or plank roads laid down exactly in the best positions for taking the produce to market—opulent cities marked out—flourishing villages—in fact, perfect El Dorados, to which it would be a passing shame to avoid going. The purchaser fixes on a beautiful plot of ground; the money is paid; the title-deeds—imposing pieces of parchment—are prepared and signed in pursuance of two or three *respectable citizens*, and the poor duped emigrant walks out of the office the fancied possessor of a tract of land on which to end his days. Eager to get to the promised paradise, he, after the lapse of a few days, arrives at the locality; but if he really finds the land well situated as he supposed, he assuredly will soon discover that there is an occupant thereon, who, pleased in every respect with his "diggins," has not the remotest intention of giving up possession to every fancied proprietor. But, in nine cases out of ten, if he really owns the land, he will find himself the owner of a "splendid swamp, or pine barren, or huge mountain of rocks and deep ravines," in which it will be a difficult matter to find as much good level land as—to use the graphic phrase of an Irishman in a similar position to that we are now describing—will suffice to "plant a pratie in." Or perhaps—and this

has often been the case—he may have had fine level land allotted him, but unfortunately not *comeatable* for the waters of a nice picturesque lake quietly reposing above it. In fact, it takes a man of sharp business habits to be up to the "thousand and one" tricks of these heartless scoundrels. A chapter detailing these would be amusing, as affording instances of the clever deception on one side, and free open confidence on the other; but, at the same time, melancholy, as exercising a baneful influence on the fate and prospects of the poor creatures who get entangled in their clutches. There are many who will read these pages who know of parties proposing to emigrate as farmers: it will be an act of humanity for them to put those on their guard by detailing what we have here given. The surest way to avoid all connection with these fellows is to go to the mayor's office, or to the commissioners of emigration, if in the large sea-port towns, and a true direction will there be given to the government land offices, of which there is one in every district. In purchasing land from private individuals, cleared or uncleared, even where the land is verily beheld by the eyes of the purchaser, and trodden thereon by his feet, care is necessary that in this case even he is not duped. It is no uncommon thing for a person, after he has paid the purchase-money, (for in such cases no instalments are taken, for obvious reasons,) and been fairly settled down, to have a call from some *friend* of the late owner, in the character of a mortgagee who had in past times advanced money on the estate, and now comes to claim it. In such a case, the unfortunate occupier has had to refund, and be consequently ruined. The only wise mode of procedure on purchasing land from private individuals, is to examine, in the very first instance, the title-deeds of the land, which will be found in the District Government Register Offices. If there is no entry there made, have nothing to do with the purchase or seller of the land.

We have already noticed a few of the peculiarities of American farms and farm steadings, rate of wages, mode of living, &c.; we shall now offer a few remarks on the mode of farming, owing to the difference of climate and other causes. Ploughing is generally done very shallow. In improving land which has been impoverished, the first step is turning over the land very deeply. The reason why Old Country farmers are so soon successful in America, is, that they at once begin to adopt the practices of Old Country farming, modified of course to suit the peculiarities of the locality, &c. If suchlike comparatively small plots of ground are near markets, they invariably cut out careless Yankee farmers from the market, in consequence of the care and attention they give to the improvement of the land; and in nothing is there greater revolution made than in ploughing and manuring. Ploughing in an American farm is a quick operation, two and three times the surface being gone over in a day than is here the practice. The roller is rarely used. In

the central and northern states, the autumn being very fine and the spring very short, it is considered very good management to give the land a rough turn over at the former season: the severe frost pulverises it, and renders it in fine condition for cropping in the spring. Indian corn is sown in "hills," dropping three or four seeds together, at the distance of a yard or so apart. The hills are continued in a line of any length required, the lines being the same distance apart as the hills. As soon as the plants are a foot or so high, they are thinned, the one or two remaining being bred up on each side. There are generally not more than two ears on each stalk. This mode of cultivation was doubtless originally caused by necessity. The stumps of the trees being scattered here and there in the field, it was impossible to make long straight furrows; so the practice, once adopted, is still retained from choice. In some places the seed is sown broadcast about the beginning of July, which is ready in time for mowing; but in this way the stalk does not attain to such a luxurious growth, nor has it time to become prolific, being cut down to serve as fodder, for which it is admirably adapted, not being so hard and coarse as the kind sown earlier.

The method of cultivating potatoes in hills is also adopted, but we believe they do not produce as well as when sown in drills, the proportion being as nineteen in the hills to twenty-four in the drills, or thereabouts. The crop is a favourite one in America, and much attended to. They are planted early in the spring after the frost has left. The young shoots are covered over to protect them in case it should return. Some of the early kinds are ready as early as June; but the beginning of July, in the central states, is the time they begin to be generally used for the table. The Carolina, or sweet potato, is much relished by some, especially in the south. We could not acquire the taste. The large species are very prolific, and are much used for feeding cattle.

The crop of wheat is a very important one. It always brings ready cash; but by a chain of unfortunate circumstances, the chief of which undoubtedly are bad management and careless cultivation, this crop is fast proceeding westward. In the north-easterly states its cultivation is almost given over. But the farmers are beginning to direct their attention to this crop in particular: it is the best paying one, and there is always a demand for it. In the western states it is produced in enormous quantities, the virgin land producing it almost without any labour; but the difficulty existing in bringing it to sea-ports, makes the farmers even there careless; but this state of matters will not be of long duration: already a chain of lakes, canals, and railroads are connecting the very remotest parts of the continent with sea-port towns on the Atlantic shores. The attention of the farmers is fully roused as to the importance of the crop; and the establishment of agricultural societies fostering this desire for improvement, we have no doubt that, in the course of

a few years, the crop of wheat will be of large amount, even in those states where it is already nearly given over. It is at all events certain, that farmers are wonderfully increasing, while it is as notorious that farms are not. Attention is now turned to the peculiar advantages of improving cleared impoverished land in the well populated states near flourishing markets—thousands upon thousands of acres of which are to be had at amazingly cheap rates, rather than undergoing all the labour of clearing land and producing grain, however easily, where there are comparatively few outlets for the products. We have already spoken of the oats; barley is a failure in some seasons. The spring being short, the hot months come quickly on, and parch up the crop before it is filled. Buck-wheat is largely used for domestic purposes, for making cakes, &c. It is sown in June, and reaped early after the Indian corn. The principal grasses are Timothy, red clover, and trefoil. The former is in general use, being of a hardy kind, and capable of enduring the severest winters. Clover is in common use—trefoil not so general. Swedish turnips are generally grown for cattle; but many other descriptions are sown, all of which succeed. Mangold wurzel is not much in use, but the soil is well adapted for it. The hardy drumhead or flat-pole cabbage, the rutabaga, and the mangold-wurzel, if drawn up before the frost, and covered well with straw on a dry piece of land, will be found to answer well all the early part of the winter, but they will not keep well throughout. The best method of preserving the late kinds of hardy cabbage, is to take them up with their roots, dig a deep trench on a dry piece of land, lay a board or straw along the bottom of it, place the cabbages on it side by side, with their roots upwards, taking care to keep the large outside leaves close down to protect them from wet, exclude the air by covering the whole closely up with soil, and they may be taken out for family use, in good condition, throughout the winter, and in fact till spring. Cabbages are not unfrequently kept in cellars and store places below the surface during the winter, but they mostly turn to a pale yellow after storing for a month or two. Peas are generally very prolific, but they should be sown early, as the scorching heat of the summer months soon dries them. A few days of very hot weather, we have seen, make them entirely unfit for the table, rendering them quite hard. In rearing cattle, it is imperatively necessary to lay in a plentiful supply of fodder. This makes the hay crop of great importance. They must be well fed and snugly sheltered during the severe winter, as, if they come out in the spring in bad condition, they fatten very poorly in the summer time; in fact, from want of attention, great mortality exists. The pigs in the back settlements lead a roving, reckless life, out in the woods almost continually, devouring acorns, roots, &c. They are capital snake hunters and eaters; they have no fear of them, but attack them boldly, and greedily devour them. The flesh of pigs

fed in this way is very fat, but the lean tries even good teeth. When fruit is plenty, they are fed largely on it, their fat being then remarkably sweet. We have spoken of snakes: they are to be met with in great numbers in the grass fields, especially in low swampy places. The mowers from the Old Country do not at first admire them, but soon become accustomed to see them winding among the grass: the old residenters coolly take them by the tale and knock their brains out on their boot toe. The dogs are generally famous snake catchers; hunt them in new-cut fields with great eagerness; and soon kill, but do not otherwise touch them.

But from these desultory notes, to return to more serious matter. Much greater attention is now paid to the rearing of sheep, the wool crop becoming daily of more increased importance. In the state of Vermont, wool is the staple production: sheep are there raised in great numbers. In the west, the wool-growing is attracting great attention. We are enabled to lay before our readers a few statistics relative to the amount and value of the clip of the present season, (1850.) The shipments of wool from Cincinnati this season, up to the first of July, amount to 1784 bales, and 14,366 lb. —the amount from the same place last year being 913 bales and 569 lb.; this great and decided increase plainly showing the increasing value of the crop. A steamer at St Louis on the Missouri river discharged at one time no less a quantity than 181 bales, (13,432 lb)., which had been shipped from Booneville, in the state of Mobile, a place containing 1200 inhabitants, but dealing largely in cattle. Over two million of pounds had been purchased of the clip of the present season at Ponteac, in Michigan county. In Brook county, Virginia, the clip has been good, and nearly all the best brought 40 cents per lb. Some of superior quality brought 45, and some very fine picked 50 cents. At Wheeling, in the state of Virginia, there has this year been much activity displayed in the wool crop. The prices ranged from 20 to 37½ cents, but superior lots brought 40 cents. The *Wool Grower*, an American publication, thus makes the following interesting statement as to the requisite quantity required for domestic consumption throughout the States. New England contains at this time 400 woollen factories capable of consuming, when in full operation, 35,000,000 lb. of wool. To supply this quantity, she has the surplus received through the New York canals, three fourths of the importations, about one quarter of the Pennsylvania receipts, and the surplus from her own wool growers; New York canals, 12,731,402 lb.; New England surplus, say 5,000,000—three-fourth importations, 13,401,000—one-fourth Pennsylvania receipts, 1,200,000—total for New England, 32,412,902 lb. New York produces about 20,000,000; and there was received from the west, by way of Buffalo, 8,250,000 more, which would leave about 8,000,000, after deducting the amount received through the canals, for home consumption. But to this is

to be added about 4,000,000 of foreign wool, making a total consumption of at least 12,000,000. Pennsylvania and New Jersey consume about 10,000,000 more, and the consumption in all other states will make about 6,000,000 more. It will require, then, for the consumption of the manufactories for the coming year, if the fabric should be in brisk demand, not less than 65,000,000 lb.

In Macomb, in the state of Michigan, there have been purchased 100,000 lb. This is *double* the product of that county in any previous year. The price has averaged 30 cents per lb. The shipments east from Buffalo were 174,600 lb. during the last *two* days of June.

The insects which are most destructive to vegetation are known as bugs. "The most mischievous is the smallest, about half the size of the fern web, of the beetle species, with yellow stripes on its wings; and there is a large black one, nearly the size of the common beetle, called the 'big bug,' which, with the grub called the 'ant worm,' will destroy acres of melons and cucumbers in a few days." In swampy districts the moskitoes during the whole of the summer are a continual source of annoyance. In more healthy places they do not torment one so much till about September. This remark refers to the northern states; in the south they swarm at all times, but are particularly annoying in the summer.

The crop of wheat varies very much, not only in different states, but in different parts of the same sections, all of course depending upon the mode of cultivation;—from five to six bushels per acre on poor exhausted land, to twenty-five and thirty on the same land improved. The same remark holds with reference to Indian corn. As explanatory of the charges for transportation of corn from the western states to the sea-ports in the Atlantic, we give the following. It may also be considered as a fair average of prices and the freight in ordinary years:—

ACCOUNT OF CHARGES OF TRANSPORTATION OF 1293 BUSHELS OF CORN FROM FULTON COUNTY IN THE STATE OF ILLINOIS, TO BOSTON IN THE STATE OF MASSACHUSETTS, AND SALE THERE.

Sales.	Dols.	Cents.
411 Sacks (at auction) 1055 bushels, at 55 cents	580	25
50 do. (damaged) 128 bushels, at 37½ cents	48	00
461 do. (granary bags,) at 6¼ cents, ...	28	81
	657	6
Charges.		
Freight on Illinois River to St Louis, 5 cents per bushel . .	64	65
Forwarding charge at St Louis (State of Missouri) . . .	10	00
Freight from St Louis to New Orleans (State of Louisiana—distance between the two places, 1212 miles,) steamboat 12½ cents per bushel	161	62
Forwarding at N. O., 1 cent. per bushel, drayage and labour 2 cents do.	38	79
461 sacks at 12½ cents, twine 2 dols.	59	62
Insurance on Illinois and Mississippi Rivers, 387 dols. at 1¼ per cent	4	84
Carry forward, . .	339	52

Brought forward,	339	52
Freight to Boston, 14 cents per bushel, primage 5 per cent	173	90
Wharfage, ½ cent per bushel, 5.91; labour and weighing, 6.95	12	86
State duty on auction sales, 1 per cent	6	33
Marine Insurance from New Orleans to Boston, 1½ per cent	10	50
Labour, advertising, postage, &c.	3	72
Commissions, 2½ per cent on 657.06 dollars	16	42
	563	25

In the western states, corn is sold at 56 lb. to the bushel; at Boston, only 53 lb. The following are given as the standard weights of various articles of produce at St Louis, state of Missouri; they may be taken as the average of the whole western states:—Wheat 60 lb. to the bushel, beans 60, clover-seed 60, potatoes 60, rye 56, corn 56, flax-seed 56, onions 57, buck-wheat 52, salt 50, barley 48, castor-beans 46, hemp-seed 44, timothy-seed 45, oats 25, bran 20, dried peaches 33, dried apples 24, stone coal 70.

The middle counties of the state of Ohio raise more wheat than any other section in the Union. They are very near the Atlantic markets; and though corn is largely produced, wheat brings nine cents on an average more per bushel than corn. From the recent report of the Board of Agriculture for the state of Ohio, the following is compiled:—In the ten southern counties the average prices of corn, wheat, oats, and hay are as follows:—Corn, 24 cents per bushel; wheat, 70½; oats, 22; hay, 5 dols. 50 cents per ton. Judging from the average product of the land, the value of an acre of corn may be taken at 14 dols. 40 cents; wheat, 12 dols.; oats, 9 dols.; and hay, 11 dols. In the ten central counties, corn averages per bushel 26 cents, wheat 79, oats 19, hay 4 dols. 50 cents per ton. In these counties the price of corn is two cents, wheat nine cents more than in the southern counties; while oats is three cents per bushel, and hay one dollar per ton, less. The relative proximity of the southern and northern markets causes this. In the ten northern counties, corn averages per bushel 33 cents, wheat 94, oats 22, hay 4 dols. 62 cents per ton. The three sections, compared, give the following:—

	Southern Counties.	Central Counties.	Northern Counties.
Corn,	0 dols. 24 cents	0 dols. 26 cents	0 dols. 33 cents.
Wheat,	0 " 70 "	0 " 79 "	0 " 94 "
Oats,	0 " 22 "	0 " 19 "	0 " 22 "
Hay,	5 " 50 "	4 " 50 "	4 " 62 "

Comparing these results with the natural adaptation of the soils, and we arrive at the commercial reason why the different parts of the state are remarkable for the different staples. Thus the southern part of Ohio, the alluvial bottoms of the Great and Little Miamies, the Scioto, Paint Creek, Deer Creek and Derby, are peculiarly adapted to Indian corn. We find therefore that it is there cheap, on account of its great abundance. Because it is cheap, and that the Atlantic ports are at a great distance, corn (maize) is there consumed in the fattening of animals. The result of this mode of culture is more profitable than that of wheat, which is raised nearer the Atlantic market, and commands a better price; for the low price of corn in the

Miamies and the Scioto is more than compensated by its adaptation to animals, and the relatively higher price of animals (cattle and hogs) in the Atlantic and European markets. Corn, then, which in proportion is the lower-priced article among the above staples, is really the most profitable to the cultivator. In the middle of the state we find the rolling lands less adapted to corn, but its soil and climate well fitted for wheat. They are also nearer the Atlantic markets; and wheat, as we see above, commands about 10 cents more a bushel than in the southern counties. . . . In the northern or lake part of the state, the soil is not well adapted to either wheat or corn; but the rolling hills of the Western Reserve are admirably adapted to grazing. But as cattle cannot be well fatted without corn, the agriculture of that part of the state turns almost entirely on dairies and sheep.

The way to reduce the price of wheat, as given in British newspapers in sterling per imperial quarter, to dollars and cents per United States bushel, is as follows:—Reduce the price per quarter into dollars and cents, at 484 per pound sterling, and divide by 9⅛, the number of United States bushels in an imperial quarter. Example: Required the price of wheat, per United States bushel, in Liverpool, when it fetches 40s. per imperial quarter. 40s. reduced is equal to 9 dol. 68 cents, which, divided by 9⅛, gives 1 dol. 8 cents as the rate per bushel, leaving a fraction of a cent to be included where greater accuracy is essential. To reduce the price of wheat, as given in American newspapers in United States currency per bushel, to sterling per imperial quarter—Example: Required the price of wheat per imperial quarter, when it fetches 1 dol. 10 cents per bushel. 1 dol. 10 cents equal to 4s. 7d., multiplied by 9⅛, is equal to 42s. 7d. per quarter.

In concluding our "Notes," we have to offer a few remarks on the capabilities of the various sections of the United States for agricultural purposes; deducing from these—which will necessarily be very brief—the most advantageous parts to which Old Country farmers may emigrate, with a view to the cultivation of the soil.

The United States of America have long presented a wide field for farmer emigrants, and it is there generally to which their steps have been directed. "The comparative ease and little cost with which the country is reached—its congenial climate—its productive soil, the fee-simple to a portion of which is so cheaply obtained—its identity of language—its similarity of manners and customs—its kindred laws," and the real or fancied equality of rights, civil, political, and religious, there obtained—all tend to bring about this state of matters. The productions of the American soil are the staple of the "American commerce, and the chief source of its wealth." Dr Franklin said, "he is a benefactor to his species who makes two blades of grass grow where one grew before;" and in no country scarcely is there more scope for such beneficial labour as in America.

The continent of America, though generally understood and spoken of as one country, is nevertheless composed of different sections of country, existing under different natural circumstances and climates. The territorial divisions are—the north-eastern

states, comprising Maine, New Hampshire, Vermont, Massachussets, Rhode Island, Connecticut, New York; the central states, comprising New Jersey, Pennsylvania, Delaware, Maryland, the District of Colombia, (or the government district,) Virginia, Ohio; the southern states, comprising North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, Tennessee; the western states, Kentucky, Indiana, Michigan, Illinois, Missouri, Wisconsin, Iowa. This vast range of territory measures, from the shores of the Atlantic to those of the Pacific, 2780 miles, and is 1300 miles broad. "The soil is of every kind, and suitable for the growth of the various plants for which the several districts are adapted. The soil of the eastern states is for the most part light and sandy; as also those portions of the southern states that approximate the sea. Farther in the interior the soil becomes rich and alluvial, more particularly the prairie lands, which are generally covered with heath, wild grapes, hop vines, &c. The north part of the United States exhibits great excess of climate; New York presents the summer of Rome and the winter of Copenhagen. . . The western region enjoys a mild climate. . . The New England states and Pennsylvania approach nearest to the climate of Great Britain."

The class of men who should emigrate with the intention of farming, is undoubtedly that large class, in many districts of our land, who have not the advantages of capital to back their efforts, and who find that they cannot compete successfully with men of large possessions and connections. To men possessed of capital, and who are and have been accustomed to all the refinements of a highly polished state of society, America is not the place. To such, a gentleman well acquainted with the state of agriculture in America, says—"I can hold out no inducements to you to come hither, nor if I could would it be, according to the principles I have laid down respecting the duty of emigration, right that you should do so. The inferior price of farm produce in this country, and the higher rate of wages, together with the less abundant crops which are raised, less owing, probably, to any inferiority of soil and climate, than to the mode of cultivation, render farming less profitable here than in England; and if farming is now what it was when I left England, I am inclined to think that the tenant of a large farm there can afford to live better than the owner of the same number of acres here." It is but fair, however, to give the opinions of those who think differently. Our desire is to enable the reader to have a good general idea of the state of agriculture in America, and we cannot do this better than by giving all sides of the question. The following is the evidence of a gentleman who has long resided in Virginia.—"I know the condition of the tenantry in Scotland, who, I believe, are at least equal to those of any

other portion of the kingdom. They are an independent, energetic, honourable, and thriving class of men. But let those of them, *even the most opulent*, who may desire to emigrate and become purchasers, and are willing to apply the same skill and energy in the improvement of their own estates in this country, (America,) and they will speedily find their circumstances vastly improved. . . A family may surround themselves with all the comforts, luxuries, and elegancies of refined life, and the most polished society, at a cheaper rate than in either Scotland or England." But there is one class of the cultivators of the soil (luckily not numerous here now) who are not wanted in America; that is, careless, lazy husbandmen—those who have a supreme contempt for the science of agriculture. It has been too long the idea that any one could farm in America. This is not the case. The belief in such a state of matters has sent over hundreds of men from this country who, with no knowledge of agriculture, have, with their gross neglect and careless management of the soil, tended to bring about the woful state of agricultural science (if science it can be called) which we have in the first pages of our paper attempted to show. Those only who have a thorough knowledge of their important calling, can successfully compete with the farmers in America, who are now beginning to turn their careful attention to the proper cultivation of the soil. Agriculture is rapidly advancing in America, "and in many instances men of capital, enterprise, and science are making it a pursuit, and the results are in a high degree satisfactory." Those only, then, who have a knowledge of farming, can fairly expect to succeed. A case in point may be given. In the course of our perambulations, we fell in with a gentleman of whom we had heard while in Scotland, as a merchant who had been rather successful in trade in the west of Scotland. On comparing notes we discovered that, although not previously acquainted, our several families had had some slight intercourse. This slight tie, in such a far off place, made us friends at once. Partly on account of an ardent admiration of America and its institutions, he had given up business and emigrated thereto. He was fortunate in obtaining a farm of small extent, but of rare natural beauty—an estate in miniature—one part as closely resembling the overhanging cliffs at Hawthornden, near Edinburgh, as two places could actually do. The land had been much neglected. The soil, however, was good, and under proper management would have been very productive. In fact, it was exactly the place for a farmer of sound practical knowledge to try his powers and be crowned with success. But our friend knew nothing of the trade he had thus taken up; and the result of three years' trial was, as he informed us, that he made as much every year as kept himself and family—a very small one —but that he saved *nothing*. Not many miles from him was the farm of a countryman, who obtained land in the same neglected

ıte; but his results were of a vastly different character. But he ıs a farmer, and knew what farming was.

In the short limits of an article we cannot be expected to give full tails of the various sections of the country, but must content our- ves with merely sketching out a few notes on the subject. And, first, to the older states. In New York there are hundreds of farms ːared, impoverished with neglect, waiting only for the exertions practical men to make them flourishing and productive tracts. e have already given instances of the cheapness of land of this ss. In Pennsylvania the same rule holds. The number of small ms is considerable, and can be easily obtained, terms generally ng one half in hand, the other half in two or three annual instal- nts. They may be had at sums varying (according to the state improvement thereon) from 5 (£1) to 20 (£4) dollars per acre. ese remarks apply more particularly to Mercer county in that te. The Erie extension of the Penn. Canal runs through the ıtre of it. This affords an excellent medium for the conveyance produce to market. But it is in the state of Virginia, as we e already hinted, that such superior advantages are offered in purchase of land which has been before cultivated. This state slave-holding one; but in the eastern part the custom of re- ing slaves is dying fast away. The owners of land having ıausted large tracts, by raising crop after crop of tobacco, have ıe off to the states of Kentucky or Tennessee, taking their es along with them; but we have it upon good authority when state, that throughout all the state a longing desire exists to rid of the system. Parties from this country need have no of being uncomfortable on this account. The Virginians will willingly obtrude their opinions upon any stranger, and are l known to be open to "friendly argument or kindly suasion." the vicinity of Petersburg, a fine old town, closely resembling se of England, there are thousands of acres, capable, by proper ivation, of producing large crops. "The soil is generally a dy loam based upon clay. In many places it varies consider- from heavy to light, but generally it is a medium, and finely pted to the production of wheat, grass, corn, cotton, tobacco, ; and no country can be better adapted to all the finest fruits— les, peaches, grapes, figs, and even the pomegranate, are in ıt perfection. The surface is generally rolling without being or too level, and the whole country abounds in fine springs xcellent water. Generally less than the half of the land is red, though the proportion varies on the lands in the market. some nearly all is cleared, and on nearly all are good comfort- buildings, which, in many instances, cost more than is now d for the whole farm. . . . Excellent land, with good build- , in tracts of 250 to 2500 acres can be had for 2 dollars (8s. 4d.) dollars per acre. For cash, lands can be had for less. The

terms generally are one third or one fourth cash; the balance in one, two, three, and often more years, with interest on the deferred payments. In many cases, by making a partial payment, and interest on the deferred portion, the credit may extend as long as the purchaser may desire." Great conveniences are afforded in the transhipment of produce by the tide-water rivers. Along with these are numerous railroads and excellent country roads. Wheat can bring very nearly the current prices in New York and Philadelphia, where they are sent for sale. The price of wheat ranges from 1 dollar to 1 dollar 20 cents, and corn from 50 to 65 cents per bushel; butter 25 to 30 cents per lb.; beef 6 to 8 cents do.; veal and mutton 6 to 10 cents; potatoes 1 dollar per bushel. The second growth of timber, now covering large tracts of land in Virginia, is generally the long-leafed pine; but clearing land of this nature is a very easy matter compared with the same operation in the states where the timber is heavy. The trees of long-leafed pine are of rapid growth and very soft: they have no wide spreading roots, and the stumps decay in the course of two years. When allowed to grow for any length of time, the timber becomes valuable. From the nature of the climate, vegetation is comparatively soon; and from the facilities of conveyance, fruit early raised can be, and is, sent to New York, before the gardeners in that state can produce a single one. The summers, however, are not so warm at night as from this it might be expected. The thermometer has considerably less range than in the north. The winters are comparatively mild: the plough may be kept going nearly the whole of it. Not so in New York and other adjacent states, or in Iowa or Wisconsin in the west: there it must be laid up for three months at least. One great advantage which Virginia possesses to Old-Country farmers is the state of society, and the nearness to which it approaches the condition of that in England. "Beneath its sunny skies the proud sons of the (English) Cavaliers reared their mansions, and spread out domains which, in aristocratic splendour, almost vie with the parks and palaces of their sires in the country they had left behind. . . . Virginia is proverbial for the hospitality and sociality of its citizens. The people are of pure English descent, and English feeling prevails to an extent that I have never found it elsewhere in the United States."

As a field for farmer emigrants, the Western States have been of late much recommended; but on this point we are inclined to differ with those who hold such an opinion. Doubtless the land is cheap, the soil productive to an astonishing extent, without any great labour, but the distance from markets is very great, and the difficulties which parties have to encounter in getting there, are greater than is generally anticipated. But taking all things into account, we are decidedly of opinion that it is the best interest of the scientific practical farmer, who may be disposed to emigrate to

America, to take cleared land in some of the older states, in the vicinity of a good market. There is no lack of such land. He not only will soon be able to make himself a comfortable home, but the means of introducing that sound knowledge of agriculture, which he will, whenever he pitches his tent, find to be wanting amongst the great majority of American farmers. In seasons when prices are low, corn is not considered worth the removal from the interior of Michigan, Indiana, and Illinois; and sometimes thousands of acres are left standing in the fields all winter, rather than lay out labour in cutting it down; but when the price increases, so that at New York the price of flour is 5 dollars per barrel, and corn 60 cents per bushel, the supply from the interior moves forward to the sea-ports. The following is a comparison between the years ending August 7, 1846 and 1847, the former year being a low-priced one, the produce passing by the Erie canal:—

Year.	Bushels Wheat.	Barrels Flour.	Bushels Corn.
1846	1,347,926	650,212	843,975
1847	2,109,679	2,328,473	3,931,345
Increase	761,753	1,678,261	3,087,370

The exportation of grain to Great Britain and Ireland for the same years, ending June 30, 1846, and September 1, 1847, was as follows:—

Year.	Bushels Wheat.	Barrels Flour.	Bushels Corn.	Barrels Corn-Meal.
1846	1,613,795	2,289,476	1,826,068	298,790
1847	4,015,134	3,150,689	17,298,744	847,280
Increase	2,401,339	861,213	15,472,676	548,490

Fifty cents a bushel for wheat, in the interior of Michigan, is said to be about equal to 1 dollar 2 cents per bushel, or 5 dollars for flour in New York; and these prices are considered as affording a fair living profit to the farmer. This will allow 52 cents for transportation from the interior to New York, which is about the average cost. The fair average price of wheat at Danzig, the great grain market of northern Europe, has been, for the last twenty years, 1 dollar per bushel—the average freight from there to England being 11 cents per bushel—from New York to England 18 cents. Forty cents a bushel of corn at New Orleans, and 56 at New York, is said to be the fair average price. At the west, grain is hauled to a river or canal, thence shipped to a lake port, thence to Buffalo, thence to Albany and New York. It pays four warehouse and shipping charges, and five distinct freights. It costs from two to three times as much to transport a barrel of flour from the far grain-growing west to New York, as thence to Liverpool. The west must, before long, burst its barriers, and open more and larger channels for communication with the Atlantic. A recent statement from a western paper says, that one-fourth of the state of Indiana cultivated in corn, would produce 200,000,000

of bushels; while another fourth in wheat could pro
The state could feed ten millions of people, ar
surplus left; and yet Indiana is the smallest
States."—B.

Lord James Hay's New Subsoil Plough. By J. I
Esq. of Kingussie, Kincardineshire.—It is a point
culture, now perfectly well established, that, aft
been drained, before it can be brought into full be
of fertility, it is absolutely necessary there should b
deepness of soil, in a *working*, or rather *workable*
manner of procuring these inches of loose soil is
various opinion in the minds of the best agricu
husbandry has now and then been mooted—I migh
a few fireside farmers, and laughed at by practical
far nearer the mark was brought before the ag
many years ago, by that truly great man, my fri
Smith of Deanston, and his subsoil plough for so
the vogue, more especially by theoretical peopl
downright farmers soon saw it was what is c
murderer," and many who had been led away
bestowed upon it by those new-fangled folks, ar
quence put themselves to charges in the purchase
Britain" of a tool, at once gave up using it, so
uncommon sight to behold a Deanston plough ly
of the smithy like her compeer in Dundrum Bay,
except for old iron. But it was not the ponderou
Deanston plough alone which caused it to go
there were other reasons, (although that, in
enough;) all good-sized farms had as many pairs o
required to draw "Mons Meg;" but it was found
horses together, not at all accustomed to the w
other, so that some did the work of two, others
all—it was found, in short, that the poor bru
bothered and strained often to very little purpo
well being at Deanston on one occasion when the
work. The horses were all in a foam, working ve
while one, disliking the work more than the res
furiously at the turnings, to the danger of the o
the men; so, to cut it short, the men took him an
of the work; and as they said they were near don
make out with four." Here, then, was proof tha
required, or four were over-worked. So much
power, (the horses.) But then came the far more
Does this operation do good—or, at any rate, does
amateur or a theoretical laird, but an actual rent-
If we look at the conversational meetings and di

Highland Society, and all other agricultural clubs and associations, it will be perceived that, so far from being a settled point in the minds of practical farmers, they are nearly equally divided whether it does good or no good. It is known to the editor of this Journal, (himself a practical man,) that while I almost venerated Mr Smith, and accounted him one of the greatest benefactors of his country, my own opinion, founded on long experience, was against the use of the subsoil plough, and greatly in favour of a common four-horse one. I saw often, where it was used to break "the pan" or "moorband," in order to let the water down, it did no such thing, but went rasping and scraping along the top of it. Again, where it was used in strong clay or till, I am convinced the good (if any) was very short-lived, the rains and the working of the land soon putting it in as compact a state as before the subsoil plough was used. I have heard and read a great deal of stuff in regard to the depth that Mr So-and-so went with his subsoil ploughing,—15, 16, and 18 inches. I have often sought, but in vain, for those tremendous deep subsoilings, and on trial with that simple but truthful witness, a foot-rule, have seldom found 12 inches had been stirred with the plough and the subsoiler; and I have never yet found *one whole field* ploughed 18 inches deep, or, in fact, one single furrow, from end to end of a field, so deep. I have seen a few show-off yards done very deep, but that is not a field. But, more than all, such deepness is useless—worse than useless; it is a great waste of labour, and consequently of money: no amount of deep cultivated soil will increase the number of quarters an acre, or the number of pounds per bushel, after you pass 12 inches. I do not deny that the quantity of straw may be increased; but as you give *extra* length to the straw, you as uniformly take from the weight and quality of the grain. In fact, all our highest weights of grain are, in general, grown on land highly manured, but not deep; and very heavy crops only recommend themselves to the farmer as heavy cattle or heavy sheep do—great quantity being more profitable than fine quality. If this be true, it follows, of course, the deepness obtained by these extraordinary subsoil ploughings is of little avail; but as, on all hands, a good deep furrow is now allowed to be part and parcel of modern husbandry, or rather, is a sequence to the Deanston system of draining—for every good farmer of the olden time knew, that to plough deep was but to increase the quantity of wet clay or mud; but as soon as the drainage of the land has been gone into, the modern and enlightened agriculturist is aware but half the work is done till he has got a furrow of a proper depth; hence the numerous endeavours that have been made of late years to get up a tool of the subsoil sort, that might be of avail for farmers occupying small holdings, and owning only a small number of horses But all the alterations of the Deanston sub-

soil have as yet been accounted failures, or nearly so. A few months ago, Lord James Hay brought out an implement, which, in my opinion, bids fair to satisfy those who wish to get a deep furrow, and yet not run into the great expense of prime cost in the tool, and the day-by-day one in the working of the old ponderous subsoil plough. I give, along with this, an outline drawing of Lord James Hay's new subsoil, constructed for a pair of ordinary sized horses or oxen.* Although exceedingly light—being made of the finest and best iron—it is quite astonishing what rude blows it will stand when coming in contact with the numerous fast stones that are found planted, causewayed, as it were, in the subsoil of this part of Scotland. I have seen it at work more than once on his lordship's own farm, or rather in the hands of his lordship's own people, who, being accustomed to it, are much more expert in the use of it than new hands will be found to be for a short time. I allude to the way in which they bring the stones out of the subsoil—keeping the implement well under the stones, and thus slackening them, so as the labourers attending (an adjunct absolutely necessary in this part of the country) get them easily turned up on the newly-ploughed ground, where they remain ready to be removed. I have been speaking of the operation when carried on in ground infested with stones in the subsoil; but I have also seen it at work where there was a "hard pan" or "moor band." And while it is not my intention to try to humbug my fellow-agriculturists, or to make the more sensible and practical ones laugh at me, by asserting that *this* or *any other* plough can be made to penetrate a plain smooth superficies of cast-iron, or iron-concrete quite as hard, while, on the contrary, I say I do not believe it myself, I shall not try to make others do so; but I *do say* it is absolutely wonderful what this slight-looking implement will penetrate if the "pan" is not of great thickness. It is well known that this singular substance varies in thickness from an inch or two to three or four feet. Now, where it is not very thick, I am convinced Lord James Hay's wheel subsoil plough will answer all the purposes required; and where the "pan" is of great thickness, I maintain all the ploughs and all the

* We have not deemed it necessary to give a figure of the plough, as its construction is so simple, that a few words of description will suffice to give an idea of it. It consists of a beam and a pair of handles of malleable iron. The shank or coulter is so placed as to have the whole of the beam in front, and the handles rising directly behind it. The beam is short, and is supported on an axle connecting two rather high wheels. The shank passes, like a common coulter, through a box in the beam, and is fixed with wedges. Its form is that of a coulter, having the point projecting forward, and inclining downwards at an angle to the horizon; and each side of its projecting point is furnished with a slight feather to stir the loosened subsoil. That the shank may take a deeper or shallower hold of the subsoil, it is moved higher up or lower down in its seat; and that the depth of furrow may be regulated to the power applied to the implement, the beam can rest either above or below the axle. An ordinary bridle is attached to a slot at the end of the beam. We do not know the dimensions of his plough.—EDITOR.

horses in Scotland cannot be made to pierce it. I have conversed with several practical men who, having heard of Lord James's plough, but who had not seen it at work, were rather of opinion that it was what farmers call many of the new inventions, "a toy;" more particularly as it might be supposed, from the narrowness of the working part, only to make a scratch or line in the "pan," say a couple of inches broad, corresponding to the breadth of the sock, while great part of the bottom of the furrow, laid bare by the operation of the precursor plough (to make use of an O'Connell phrase) would be left in an undisturbed state. To satisfy myself as to this, I had a transverse section of the ground cleared of all the earth with a shovel right across the furrow, when I found the subsoil raised up in lumps or cakes the *whole* breadth of the furrow; and this I uniformly found on repeated examinations. There is yet another sort of ground where Lord James Hay's subsoil plough is likely to answer better than either where the ground is beset with fast stones, or the soil rests upon "a pan;" I mean strong impervious clay or till: here I think it may be expected to work in a superior manner, and do good service to the small farmer, who cannot command the requisite number of strong horses to put the original subsoil plough "under weigh."—If we look at the discussions in the agricultural meetings as regards the good derived from the use of subsoil ploughing as compared with a very deep furrow obtained by the operation of a common four-horse plough, we find the votes not far from equal; so that it appears a point on which we require a little more information. For the purpose of gaining this, I have had two acres measured off in the same field alongside of each other; and with the same ploughmen, the same oxen, and the same labourers, (to take up the loosened stones,) I have had one acre done with two ploughs, a common one preceding the new subsoil one, and the second acre ploughed with four oxen in a common trench plough. The exact number of hours employed on each acre has been minutely noted; the comparative fitness for drilling into turnip—the difference, if any, in the turnip crop—will all be accurately observed; and I would urge on all, who desire to be certified as to the value or inexpediency of subsoiling, to make trial in the way I am about to do, which is the only thing we can do to set the matter at rest. But these things belong to the *system*, the *principle* of subsoil ploughing or not; the *invention* of this light wheel-subsoil by Lord James Hay has, we are certain, achieved a great improvement on the old one. It does away with the necessity of injuriously putting several pairs of horses together on large farms, and it brings the operation within the reach of those who have only four working cattle on small ones. It is, comparatively speaking, a small expense, costing only about £4, 4s., while the old plough was about £15; and last, although not least, it is much more

easy for the ploughman to hold—the wheels equalising the draught to the horses, and keeping the implement steady to the work; while it can be properly regulated to the draught of either horses or oxen by shifting the beam, and working it either above or below the axle of the wheels, as the ploughman finds best. Railway and steam has now made transport so quick and so easy, that I would strongly advise all who are engaged in the improvement of the soil to give his lordship's invention a trial, by ordering a plough from the maker, Mr James Arthur, King Street Road, Aberdeen, and feel assured they will not repent it.

Chemical absorbent power of Soil. By J. TOWERS, A.C., Member of the Royal Agricultural and Horticultural Societies.—"*Of what use has chemistry been to cultivation?*" This question embodied the substance of a reply received by the writer from His Grace the Duke of Portland, to whom he had the honour, in the spring of 1834, to address a letter on that subject, wherein he appealed to the successful practice of the renowned chemist, Lavoisier, upon his estates in La Vendée. Sixteen years ago—five years before the publication of Liebig's first edition had brought chemical researches into fashion, and induced every peripatetic lecturer to involve himself and his audience in the mist of infinitesimal atomic proportions—it became extremely difficult to meet the straightforward matter-of-fact objections comprised in the few annexed words:—"It is not improbable that if the success of Lavoisier's practice was inquired into, it would turn out that he had merely improved upon the usual bad husbandry of France." But how stands the case *now*, in the year 1850? Have not the practical experiments with bones, the discovery of the advantage to be derived from the solution or breaking up of bones by the action of sulphuric acid, the comparison of effects produced by bones in the condition of dust, wherein they retain all the animal matter which comprises the elements of ammonia, and when, by being burned, they retain phosphate of lime as the chief constituent, combined with a small portion of phosphate of magnesia, and about one-fourth of chalk, (*carbonate* of lime,) have not all these, and many more great facts now brought to bear upon agriculture, been elicited by pure experimental chemistry? Will any one be hardy enough to answer in the negative?

Be this as it may; for prepossession is but too apt to adhere as [illegible]. The experiments recorded in the Journal of the Royal Agricultural Society of England, vol. xi. part 1, in two articles upon the *Absorbent Power of Soils*, by Mr Thompson, pp. 68–74, and by Professor Way, pp. 313–379, are so purely chemical, and yet so decisive, that no candid and intelligent reader can hesitate to award the palm to *that science*, which must so justly claim it. It is not my object to plagiarise, [illegible] to build upon the legitimate

foundation of others. The simple analytic processes which will be speedily detailed, are strictly my own, performed within the few past weeks, and still in a course of progressive revisal. They originated in a trial made by me in Berkshire—certainly above fifteen years ago—with a view to determine the effect of *liquid manure* upon a plant growing in a pot, without any reference to the *absorptive power of soils.* The results of that experiment remained fixed in the memory; and there they lay dormant till the account of Mr Way's analysis awakened recollection, and led me to repeat, as nearly as possible, the former process, and then to enter upon a series of testings, by a variety of chemical re-agents, which might ascertain the nature of the several changes induced by the passage of manuring fluids through a body of ordinary garden earth. I shall now recite, with rather minute particularity, the course pursued by me, by which I hope it will be made to appear that the experiments of Messrs Thompson and Way furnish conclusive evidence of the reciprocal agency exerted between soils and manures, and that this agency *is chemical.* Therefore, as the phenomena thus truthfully revealed are of inevitable and constant recurrence, whenever manures, whether fluid or solid, are applied to soils fitted to produce luxuriant field or garden crops, the utility of chemistry to agriculture is proved beyond hesitation or doubt.

I have made no attempt to adopt a rigid quantitative analysis, by processes which can only be conducted with refined apparatus in the laboratory of a philosophical chemist. The inquiry is in good hands, and will also, I trust, be urged onward by Professor Johnston, now that he is returned amongst us: and in the laboratory of the Highland Society, as well as in that of Professor Way, who assured me in a note, per date August 22, that "the subject he had in hand was almost as infinite as it was interesting."

There are, I have little doubt, numbers of observant gardeners who can go with me when I state, that a quantity of dark-coloured liquid manure, very fetid and offensive in smell, being poured over the surface of the mould in a pot to saturation, after percolating the whole bulk of soil, a portion of fluid, void of smell or colour, and limpid nearly as common water, has passed into a pan beneath the pot. In these lines I have related the careless and crude operation to which I before referred. I took no further steps to investigate the *cause of effects* which at the time only surprised me; but since the publication of the papers alluded to, the following processes have been adopted with some degree of perseverance:—

A *liquid manure* was prepared for the occasion by digesting a quantity (three ordinary garden trowels, scoop-shaped), of *horse-droppings* in about three quarts of rain-water, to which was added two fluid drachms of strong caustic ammonia, (liquor ammoniæ fortis.) The droppings had lain in heap about two months, thus

partially fermenting, till they became brown and somewhat broken up. The change of colour proved that humid matter to some extent was already formed; and therefore the ammonia was added as its most perfect solvent, producing a fluid brown *humate of ammonia.* After occasional stirring and digestion for twenty-four to thirty-six hours, this brown liquid was poured off, and suffered to deposit feculences till it became sufficiently clear for every future experiment; and here, be it observed, we have an extempore type of all those fluids which proceed from dunghills, mixtures of farm-yard dungs, whether simple or compound, fresh and untainted, or stale and fetid; a fact which may be instructively established, or otherwise, by a course of comparative experiments.

Before entering into detail of my analytic testing, I would solicit attention to a principle of great moment, which is indirectly connected with the main question now under consideration. The *theory of liming* has not been fully understood, but much light was thrown upon it by a series of experiments announced some years ago by Mr Rowlandson of Liverpool. Lime is always required when land is surcharged with decayed vegetable matter—that is, with the substances called *humus* and *humic acid.* All the true alkalies—potassa, soda, and ammonia, the last particularly—are solvents, and hold humic acid in the condition of liquid humates; hence it is that ammonia, added to manures, extracts humus from them; thus, in fermenting dunghills, it produces the brown liquor that flows to waste. Lime acts specifically upon dissolved humic matter, attracting it from every alkaline base, and *fixing* it in the condition of a nearly *in*soluble *humate of lime.* Thus, if the liquid manure prepared from horse droppings—or, in its place, the drainage of a dung-mixen—be treated with a portion of lime-water or cream of quicklime, the brown colour will be discharged, and fall down in dingy flocks, united with an equivalent of lime, which, in this case, becomes *a base* saturated with humic acid.

Having established the paramount affinity of lime, I proceed with the analytic experiments in the regular order of the series:—

1. A few pounds of garden earth were screened through a wire sieve, so as merely to separate stones and root fibres. It was air-dried only, and in that state carefully and *equally* transferred to a white glass vessel to act as a drainer or funnel. The glass was a cylinder 8 inches in length and 4 inches in diameter, and drawn in one end to a neck terminating in a small orifice. It was inverted, with the small orifice downmost, having a piece of linen tied over it, and made to rest securely upon another vessel like a stout tumbler or goblet to receive the drainage—which we shall in future term the filtrate. Mr Way employed a tube 20 inches long, and of only three-fourth inch internal diameter. The earth used by me was a fertile vegetable soil, containing some sand [illegible] as loam but so small a portion of chalk, (*carbonate of*

lime,) that very slight hissing was produced by dropping upon it, when wet, a little strong muriatic acid. The soil used by Mr Way had been received from Mr Pusey; and, according to the tabulated items, it consisted of:—

	Per cent.
Water,	20.56
Vegetable matter,	6.17
Sand and clay, insoluble in acids,	59.
Carbonate of lime,	5.94
Oxide of iron and alumina,	7.90
Potash, } dissolved out by acids,	.31
Soda, } dissolved out by acids,	.12
Phosphoric acid,	0.0
Magnesia,	0.0
	100.00

2. The soil used by me having been tested for lime, as stated, the next step was to try whether the clear brown fluid contained any sensible (free) carbonate of ammonia, or any ammonia in combination; and an affirmative was obtained by immersing a small piece of quicklime, which, when a strip of glass moistened with muriatic acid was held almost close over it, produced a haze of sal-ammoniac vapour. A drop or two of caustic potash liquor caused a similar development. Muriatic acid on glass held over the fluid alone produced a very slight haze—a consequence of the small quantity of caustic ammonia, with the horse droppings being in excess.

3. Lime might exist in some combination, and so might *muriatic* and *sulphuric* acids. To determine the questions, a little of the manure was diluted, with an equal bulk of rain water, in three test tubes, and tested, first, for lime, with a few drops of oxalate of ammonia—by which powerful agent no white turbidity was occasioned. Three barytic tests—namely, the pure barytic water, the nitrate, and acetate of baryta—failed to discover sulphuric acid; as did also nitrate of silver nearly, when employed to discover any muriatic acid. If test tubes be absent, a few watch glasses, and as many narrow strips of glass, will answer perfectly; the former to contain some drops of the manure, and the latter to apply *each its own* distinct droplet of liquid re-agent. Experimenters must always be very careful never to employ the same strip for two tests: cleanness and freedom from mixture can alone secure accurate results. The white liquid manure was thus examined: The process of filtration was also going on; the glass, containing mould to within an inch of its rim, was made to rest upon the receiving vessel; and, in the first place, two fluid ounces, by a glass measure, were distributed as equally as possible over the soil, and suffered to soak into it before another similar quantity was added. The utility of glass vessels here becomes evident, for they enable the operator to watch the progress of the absorption, and to observe whether the soil be regularly distributed or otherwise, and thus to avoid errors arising from inequality.

As the soil absorbs the fluid, the colour changes, and this progressive change indicates the state when another portion should be added. In my first experiment, I noted that three two-ounce doses penetrated the mass; but a fourth was required before any drops passed through the linen. Then, finding that the filtrate was quite pale and clear, more manure was added, till at length 12 ounces were so used, the filtration going on till three fluid ounces had passed, when it was seen that the filtrate became coloured, proving that chemical action had ceased.

Here a cautionary remark may not be inappropriate. Whenever the change of its tint shall indicate that the soil has been penetrated throughout, the operator will do well to wait a quarter of an hour, and thus give time for the play of affinities between the constituents of the manure and those of the soil. After that period, another dose will most probably expel a certain portion of filtrate, which, if it be bright and colourless, should flow on till it cease to pass, and then be collected and reserved in a clean phial: on the contrary, if foul, it should be returned over the soil. I recur to the experiments.

4. The *clear filtrate*, void of colour, was tested in a very small tube by *oxalate of ammonia*; by the first drop of which a milkiness was produced, and a copious deposit of oxalate of lime was the final result. Three drops, or even less, on a small watch-glass, touched with a glass point moistened with oxalate of ammonia, would suffice to indicate this leading fact. The presence of a salt or salts of lime was detected by the taste; and it was proved at once by touching a drop or two on glass, with a glass point dipped in a spirituous solution of soap that was curdled instantaneously; thus establishing the great and important truth that manures are agents which expel *hard water* from the earths that they enrich.

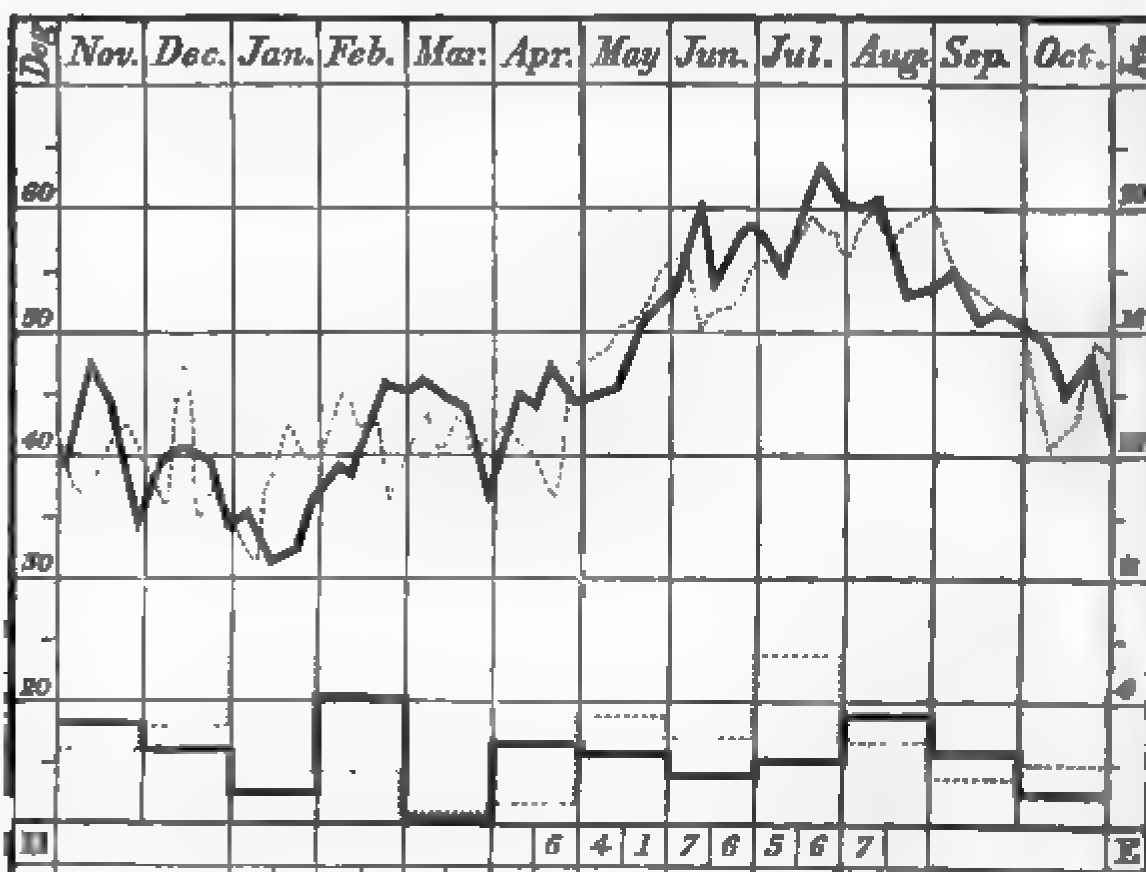
The question which, in the next place, presented itself would be this: If lime, which could not be detected in the manure itself, was present in the clear filtrate that passed from the soil, whence was it derived, and with what acid or acids was it combined and held in solution? The reader, by referring to No. 3, will perceive that negative evidence alone was obtained from the re-agents applied to the liquid manure; it now remains to state that, by appealing to quicklime and caustic potash, the filtrate yielded merely a faint trace of ammonia, and even that depended upon the passing of a little undecomposed liquid manure, a surplus of which had finally been poured over the soil. The three barytic tests before mentioned—*i.e.*, the *pure water*, the nitrate, and the acetate severally used, each with its own individual portion of filtrate, obtained positive results; the first producing a faint turbidity, the two others very decisive evidence of the existence of sulphuric acid—proving that a portion of the lime was expelled in the condition of gypsum (plaster of Paris). Finally *nitrate of silver* gave an

ndant precipitation of the chloride of that metal, by which the ience of hydrochloric acid was manifested.

Inough has been said of the simple processes selected by me to rtain the nature of chemical changes effected by the filtration, r interstitial permeation, of a liquid manure, prepared expressly the purposes of interpreting the effects of a casual experiment le in a bygone year, and of bearing out the principles of fessor Way, which were founded upon the results of a most nprehensive series of experiments. There is one difficulty which olves the comparative results elicited by my investigations. It is : The *manure liquid* tested for lime, muriatic and sulphuric ls, yielded merely faint traces of any of those constituents, ch were, in *every series*, detected abundantly in the *filtrate.* othing can come of nothing," therefore we must refer to the as the source of those products in the latter which could not traced in the former. I subscribe to the truth of Mr Way's ement to me, "that the presence of much lime in the filtered uids is to be accounted for by the original liquid containing s of potash, magnesia, and ammonia: these part with their base he soil, and take up *lime* to combine with the respective acids." A writer in the *Gardener and Farmer's Journal*, as I collect n page 403 of the *Farmer's Magazine* of November, observes, here is, however, a remarkable and noticeable change in the er, which has given up one of its salts: it becomes charged h another. It may be remembered that Mr Thompson's soil tained, after filtration, in the one case, four grains of gypsum, in the other case one grain of gypsum; and therefore it ears, that the sulphuric acid of the sulphate of ammonia which had applied attached itself to the lime." This inference is losophical; but how stands the case, when neither sulphate nor riate was used, nor traced in the dung water compounded by ? I applied, as stated, a portion of caustic solution of ammonia, ttract and fix the humic matter of the droppings; and that it had ie so, and most effectually too, was proved by the unerring test ime water. Therefore, to account for the copious deposition of s of lime, through the agency of a liquid manure which appeared be destitute of such elements, we must, I think, refer to the iprocal attraction exerted between the humate of ammonia in liquid and the lime of the mould used as a filter, in conjunction h a portion of common salt remaining in that medium, as from e to time I was in the habit of sprinkling small quantities of over the surface earth of the garden. There is mystery yet oe accounted for, which can only be solved, or even approached, a rigid quantitative analysis of the soil itself, and this I have ther leisure nor desire now to undertake. I have stated simple ts, and this article must be regarded as merely an introduction general principles. As such, it appears to be proved that loamy

earths (for the presence of loam is required) seize all the colouring and humic matter of liquid manures chemically, and not merely as mechanical strainers; that they attract the bases of ammoniacal salts, thereby setting free the combining acid, be it what it may, which then attracts its equivalent of lime existing in the loam, which therefore passes down as a salt of lime with the filtrate liquor. But other and more complex affinities are in play, for the lime of the earth never exists as such, but generally as a sulphate or carbonate. However, not to enlarge, or deal in mere conjecture, enough, I hope, has been said to rouse attention and severe research; and I now bring the paper to a close by observing, that a solution of Peruvian guano, three drachms by weight, (equal to a hundred and eighty grains,) with twenty-four fluid ounces of rain-water, produced all the salts of lime before obtained by filtration through the same soil, and many more complicated results. The experiments and testings are numerous and most interesting, and have occupied attention for several weeks. They all, however, substantiate the *theory* of absorption, and verify the experiments announced in the *Royal Agricultural Journal.*

Thermometrographia for the Agricultural Season ending with October 1850. From observations at Annat Cottage, Perthshire; N. Lat. 56° 25′, Elevation 170 feet.



Explanation.—The *upper* dark line shows the weekly averages of temperature for the season, referring to the scale of degrees in the left hand column; the dotted line shows the averages of temperature for the season ending with October 1849. The

lower dark line shows the monthly depth of rain, the scale of inches being in the right hand column; the dotted line shows the fall of rain for the previous season. The figures between D and E show at what times the past season was *earlier* than the previous one, and the number of *days*, in the first and last parts of each month. The figures between D and L indicate *days later*. The observations were made on the times at which certain plants put forth their flowers.

The mean temperature of the vegetating season, March 20 to October 20, was 52.5 degrees, being under the average, and as low as in 1849, though not so low as in 1848. This is at first sight surprising, after such a warm and sunny summer, but the cause lies in the comparative coldness of May, and the circumstance that the severe frost in the end of March came within the bounds of what meteorologists have fixed on as being the vegetating season in Britain.

Mean temperature for the twelve months ending with October 1850=47.27 degrees; do., October 1849=46.75 degrees ; do., on an average of years = 47.86 degrees.

Fall of rain for the twelve months = 27.8 inches ; do. previous season = 33.46 inches : do., on an average of years, 27.93 inches. The fall of rain measured considerably less in some parts of the country,* and, even at this place, the season was much drier than the number of inches recorded would indicate. Evaporation was strong throughout a great part of the season, and rain often fell in slight showers, which were measured by the rain-gauge, but which did not impart much moisture to the soil, drying winds having uniformly succeeded each shower. Hence the failure and drying up of spring-wells, and the remark made by many, that the season was as dry as that of 1826, a remark not supported by facts, in so far as the rain-gauge is concerned. The depth for the twelve months, moreover, was increased by an excess in December and February, which had no influence on the soil in the summer season. Yet the depth in the seven months of the vegetating season was 16.2 inches, or more than fell in the whole year 1826.

Mean atmospherical pressure=29.515 inches. Greatest pressure, Dec. 22,=30.46 inches, the weather being frosty. Least do., Feb. 5, = 28.23 inches, with showers and stormy winds from the south-west. Highest monthly mean in March = 29.798 inches. Lowest do. in January = 29.311 inches. Longest period of high pressure in September, when, from the 4th to the 16th, inclusive, the readings of the barometer were above 30 inches. The mean for the month was 29.730 inches, being next highest to the mean for March.

The means of temperature for all the months were, less or more, under the average, except in February, March, and June. The decrease in July, and some of the other months, however, was but very slight, so that they might be stated as having about an average of temperature.

Kemp's Agricultural Physiology.†—Dr Kemp tells us, in his preface, that there is a degree of popular misapprehension in the opinion that the science of agriculture is more closely dependent on chemistry than on physiology. But as he admits, in the very next sentence, "that chemistry is as essential to the study of all mixed physical science as an alphabet is to that of language," we make no ground of quarrel with him on this point. Physiology, in its largest acceptation, comprises the laws in accordance with which are determined and regulated the production and development, the maintenance and decay, of organic bodies ; under which head fall all the members of two of the great divisions of nature—the vegetable kingdom and the animal kingdom. The conditions requisite for the development and maintenance of the bodies of

* At Edinburgh the fall of rain for the season, up to the beginning of December, has only been between 14 and 15 inches—the average being about 24 inches.—EDITOR.

† *Agricultural Physiology, Animal and Vegetable, designed for the use of Practical Agriculturists.* By T. LINDLEY KEMP, M.D. 12mo, pp. 244. Blackwood and Sons, Edinburgh. 1850.

animals are well known to be due supplies of food, drink, air, and warmth; and a very little consideration will satisfy every one that like conditions are essential to the growth and maturity of plants, whether these be the trees of the forest or the crops of the field. Take an acorn in your hand—attend to the smallness of its size—consider the insignificance of its weight—and then look on an oak which has felt the sun of fifty or sixty summers, and withstood the blasts of as many winters. Reflect how immense is the difference between them in size and weight; yet it cannot be doubted that that oak was once no bigger than the acorn in your hand; it sprang from such an acorn: all that mass of trunk, and branches, and leaves, have become developed, in accordance with established physiological laws, from a little organic body like that in your hand. Surely no one will believe that all that mass of timber has grown out of a little acorn, without the addition of any matter from without. Whence, then, has that supply of substance been obtained by which the insignificant acorn has been transformed into the gigantic oak? Even fancy can suggest no other sources of this supply but the soil, the rain which falls upon the soil, and the surrounding air. From these sources, then, in the first instance, it is allowable to conjecture that all that mass of substance which makes the difference between the bulk of the full-grown oak and that of the acorn has been drawn. It is quite true that there are no oak fibres, however minute, to be found, either in the air, in rain-water, or in the soil. But surely it is no longer difficult to apprehend and become familiar with the notion that a body may form out of materials in which no entire part of itself exists. There is no spirit—that is, there is nothing of what chemists term alcohol in malt, hops, or spring-water, and yet out of these, ale, beer, porter, have their birth. And nobody can be ignorant, at this time of day, that ale, beer, and porter owe their exhilarating qualities to the presence of a portion of that same spirit or alcohol, which, in a less disguised form, is known as brandy, rum, hollands, and whisky. If, then, spirit or alcohol, without existing in malt, hops, or spring-water, can be got out of these, it cannot be more difficult to conceive that oak-wood, without being present in the soil, rain-water, or the air, may form out of these. But, more than this, chemists show us that oak-wood is a compound substance, made up of certain simple elements—that is, of materials which they call simple, because they cannot extract anything out of them but portions of themselves; and they also prove to us that these same elements of oak-wood are to be detected either in the soil, or in rain-water, or in the air. Why, then, should it be doubted that the acorn grows into the mature oak by the gradual incorporation, with its original substance, of those elements of oak-wood which are found to exist in the soil, in rain-water, and in air? Can any reason be assigned

why we should hesitate to say that plants, like animals, are nourished by food, and that their food is drawn from the three sources now enumerated? It is true we cannot point to the perceptible disappearance of the food of a plant in proportion as the plant grows, in the same unequivocal manner in which is consumed a stock of provisions set aside for the use of men, sheep, or oxen. And this points to the very reason why the idea of plants being nourished by food like animals, is new to the agriculturist. Plants do not feed by taking a visible quantity of food into a stomach by a conspicuous aperture, like the mouth of an animal: they take in their food by innumerable minute apertures in the extremities of the roots and on the surface of the leaves; and hence mere popular observation could not discover the fact that they feed at all. The most superficial attention could not miss the fact that animals feed; but as plants feed in secret, beneath the soil, and where the surface of the leaves touches the invisible air, observations, contrived under the direction of scientific rules or principles, are requisite to make the fact apparent. But as soon as the mere idea of plants feeding like animals obtains a grasp of the mind, the proofs begin to thicken. The feeding of plants is like the second stage in the feeding of animals—that which takes place in the upper part of the intestines, after an elaborate preparation in the stomach. Here innumerable minute apertures take up the nutritious part of the food already separated, by complicated processes, from the refuse which is to be expelled. There is, then, an analogy between what is known to take place in the feeding of animals and the idea that plants feed, which affords a material support to the truth of that idea. Plants have no stomach; but in the soil through which their radicles spread, their food undergoes a preparation analogous to that which the food of animals is subjected to in their stomachs preparatory to being taken up by the minute orifices in the upper part of the intestines. In short, the soil performs the office of a stomach to plants, and the changes which take place in the soil may be regarded as truly analogous to those which are effected on the food of animals in their stomachs. But though the food of plants does not visibly waste like the food of animals, nobody doubts that the fertility of a soil is exhausted by successive crops. And this fact affords the crowning proof that plants feed like animals. For surely it is to deceive ourselves with words to say that a field, after a certain time, fails to afford the same abundance of crop as before, because it requires rest as animals require sleep. This explanation carries with it, indeed, a good sound; but how empty is it of substance when set beside that other explanation which ascribes the deficiency of the crop to the exhaustion of some one or more of the materials which should have served for nourishment. In short, the poverty of a

crop, raised on a field which has been scourged of its nutritive matter, is just as clearly accounted for as the proverbial poverty of a church-mouse.

It is by physiology, then, that the conditions necessary for the growth of crops are to be explained; and chemistry is here the handmaid of physiology, because it is by chemical analysis alone that it can be ascertained how far the particular materials required for the nourishment of each crop are present in the soil on which it is to be sown. In like manner, it is by animal physiology that the general principles are to be brought out which are applicable to the profitable feeding of cattle—principles, by the use of which many expensive errors may be avoided. Science, however, does not supersede experience. Without experience science betrays into error; but experience and science conjoined are the best safeguard from error.

Dr Kemp's book consists of twenty chapters and an appendix. The first chapter is on the chemical and vital laws of nature. In this he describes the characters of organic bodies—their origin from previously existing organised beings—their property of assimilating or incorporating with their own substance surrounding matters—their continuance in this state of activity for a time—and the final decay of this power; in consequence of which their structure loses its former appearance and state of combination, and becomes subject to the laws which regulate inorganic matter—that is, their susceptibility of death. Again, he points out that all the objects in the world—organic and inorganic—notwithstanding their extreme diversity, are merely different combinations of a very few elementary bodies; that an elementary or simple body is that which contains only one kind of matter; that water, for example, is a compound substance, because it can be separated into two other bodies, namely, oxygen and hydrogen; that neither of these two last-mentioned bodies can be separated into other bodies, and hence that they are regarded as elementary; that the number of elementary bodies of which all the compound bodies, either in or on the earth, consist, is only fifty-five; that of these by far the most important are oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, silicon, potassium, sodium, calcium, aluminum, and iron. From the same chapter we quote the following passage:—

When we consider the various kinds of animals, the immense diversity of plants, the different descriptions of soils, of rocks, and of gases, it may seem very strange that they are composed of so small a number of elements. But a very minute amount of difference of constitution, or even of the proportion of the same elements, makes an immense difference in the appearance and properties of a compound substance. Thus, when one part of oxygen and one of hydrogen (both gases) are mixed together, and fixed by proper means, water, whose appearance and properties are well known, is formed. If, however, the compound which consists of two parts of oxygen to one of hydrogen be prepared, it has no resemblance to water except its fluidity, and it has a strong metallic taste. Air, again, is a compound of nitrogen and oxygen. Another compound of nitrogen and oxygen—the elements being in a different proportion—is laughing gas, which, when breathed, produces a transitory

intoxication, usually attended with facetiousness; while a third compound of the same elements, but in a different proportion still, is a highly corrosive acid, destroying everything it touches, and well known by the name of nitric acid or aquafortis. Sugar, again, consists of carbon, oxygen, and hydrogen. If, however, from this a little of its oxygen and carbon be taken, what is left is alcohol or spirit. This process ensues whenever anything containing sugar is fermented. The various laws which regulate the combinations of bodies are called the laws of chemical affinity. This chemical affinity is exercised between the minutest particles of bodies, and it is indispensable for its action that these particles be in contact with one another.—p. 3-4.

Our author then proceeds to describe briefly the several chemical bodies, simple and compound, which have the most direct bearing on his subject.

His second chapter is on the classification of animals and plants. His third chapter is entitled "Intentions of Creation; Conditions necessary to the continuance of life." Everything in the material world, he says, is specially created to minister to the service of man. He proceeds to show that vegetables perform two very important functions. The animal kingdom is unceasingly pouring forth carbonic acid gas into the atmosphere; and this carbonic acid gas, if it were allowed to accumulate there, would quickly prove poisonous to animal life; but one of the great offices of the vegetable kingdom is to destroy this carbonic acid gas, which it does by taking from it one of its elements—namely, its carbon—and converting it into its own substance. Again, the food of animals must consist of the elements which exist in the animal structures, and these must be in an organic state. But as animals produce no organic matter, and are continually reducing that kind of matter to the inorganic state, the organic matter at the surface of the earth would, in the course of time, be consumed. But this result is provided against by the second great function of the vegetable kingdom—that, namely, by which it converts the inorganic matter of the earth's surface into organic matter fit for the food of animals.

His fourth chapter is on the circulation. This function is illustrated by numerous well-executed woodcuts. The fifth chapter is on the properties of the circulating fluid. From this chapter we extract the following passage:—

The first remark to be made upon the nourishing fluid of plants is, that it always contains a substance of the nature of gum or sugar. The properties of gum will be considered in the next chapter, as well as those of the other substances immediately to be attended to. We shall here only mention, that it consists of carbon, hydrogen, and oxygen. That the basis of the nourishing fluid of plants should be gum is very intelligible, when we consider that the greater part of the structure of plants (which structure is, of course, formed out of the nourishing fluid) consists of the same elements as gum does. We may specify wood or woody fibre, the waxes of plants, their oils, resins, &c.

But the nourishing fluid of plants must contain also the other elements, which, although in much smaller quantities, make up the structure of vegetable beings. Many parts, for instance, of plants contain nitrogen, and all plants contain some of the following elementary bodies—potassium, calcium, magnesium, sodium, silicon, aluminum, iron, manganese, sulphur, phosphorus, and chlorine. The nourishing fluid of any plant must, and does, contain all the elements of which the structure of that individual plant is composed.

Besides providing for their own structure, plants lay up a store of nutriment for the young embryo that springs from them. This must likewise be formed from the nourishing fluid. This substance, we may add, is always insoluble in cold water, and is known by the name of starch. It is obtained in abundance from potatoes and other roots, from flour and from many other vegetable products.—p. 58-59.

Dr Kemp then proceeds to consider the properties of the blood—the nourishing fluid of animals. As the blood not only forms at first, but keeps up every part of the body, it must comprise all the elements which enter into the composition of the body; and as these elements are continually passing out of the living system, the supply must be constant in a corresponding degree. As nitrogen is an element much more generally diffused through the animal parts and textures than it is through vegetable substances, the basis of the blood is not a body composed of oxygen, carbon, and hydrogen, like gum—but the compound, albumen, in which, besides these just-mentioned elements, nitrogen is contained; and before this compound is converted into the animal tissue, it appears to be changed into another substance, also found in the blood—namely, fibrin. This fibrin differs from albumen in properties much more than in composition. The blood also contains such other elementary bodies, besides the constituents of albumen and fibrin, as enter, in however small proportion, into the animal tissues—namely, potassium, sodium, calcium, magnesium, silicon, aluminum, iron, sulphur, phosphorus, and chlorine. The blood also contains fat; and the office of fat in animals seems analogous to that of starch in plants; and it is singular that animals have the power of converting starch into fat.

The sixth chapter treats of nutrition and absorption. A plant or young animal regularly increases in bulk; and the nutriment to which this increase is due is clearly derived from without. Again, in animals there is a never-ceasing disappearance of their solids by absorption; and as their bulk does not diminish, there must be continual additions made by nutrition. Again, the nutrient fluid does not increase in quantity, notwithstanding the continual additions made to it by the roots and leaves in vegetables, and through the digestive organs in animals. And this exactly corresponds with the idea that the several solids and proper juices of plants and animals continually abstract something from this nutrient fluid. Secretion is a special form of nutrition: it is the term applied to signify in particular the production of a fluid compound from the circulating fluid; while, by contrast, nutrition is employed to denote the deposition of a solid product. The products of nutrition and secretion in both animals and plants, or organic compounds in general, range themselves under three great classes—namely, the saccharine or sugary, or such compounds as consist of carbon, oxygen, and hydrogen—the oxygen and hydrogen being in the same proportion which they bear to each other in water: sugar, gum, and starch are examples: 2. The oleaginous, or oily, which also consist of oxygen, hydrogen, and carbon, while

the oxygen is in less proportion than would be required to change the whole of their hydrogen into water; animal fats, oils, urea, are examples: 3. The albuminous, or fleshy, which contain nitrogen, besides oxygen, hydrogen, and carbon—the nitrogen being in the proportion of fifteen per cent; and, besides these elements, sulphur, phosphorus, &c., in minute proportion, seem to be essential constituents; albumen and fibrin are the principal examples. Interstitial absorption is the absorption of the solid parts of a living body, which proceeds actively at all times in animals, but does not exist in plants,—absorption in plants being confined to that of nutritive matters.

The seventh chapter is on "the properties of the principal textures and secretions formed in plants out of the sap." From this chapter we select what Dr Kemp says of the roots of plants:—

That which is usually called the root is nothing more than a subterranean stem, in no ways different from the stem above ground, excepting that it has no pith.

The real root consists of the mass of little spongioles which grow from the subterranean stems. These spongioles are imbedded in cellular tissue, sometimes to a great extent. Along with this cellular tissue some of the secretions of plants are frequently present; and when these happen to be albumen, gluten, oil, &c., the root is suitable for food, as is the case with the turnip, parsnip, &c.

The office of the spongioles is to obtain from the soil the water, ammonia, potassium, sodium, sulphur, &c., of which the plant stands in need for its growth; and they have undoubtedly the vital power of selecting the elements which the plant requires, and of rejecting those which it does not.

It has been supposed that the spongioles possess the power of excreting from the plant effete matter; but of this no satisfactory evidence exists; and it is for other reasons improbable.—p. 85, 86.

The eighth chapter is on "the properties of the textures and secretions formed in the bodies of men and animals out of the blood." From this chapter we select what he says of fat:—

The oleaginous principles of animals are the same as those of vegetables, and consist of margarin, stearin, and olein. We may give, as an instance of this, the analysis of olive oil and mutton fat.

	Olive Oil.		Mutton Fat.	
	Olein.	Stearin.	Olein.	Stearin.
Carbon, .	76	82	79	78
Hydrogen, .	11	11	11	11
Oxygen, .	12	6	9	9

One use of animal fat is to preserve symmetry, and to obviate the effects of pressure. Another use of it (the details of which will afterwards be explained) is to supply carbon for the purpose of producing animal heat. But it is also the product of superfluous food, laid by to supply the wants of the system, (in so far as a supply of carbon is concerned,) in case the food or the digestion should fail. It is found that the body is changed the faster, the greater the amount of exercise that is taken. Thus, carnivorous animals, that take a great amount of exercise, are almost destitute of fat, their carbon being used or expended as fast as it is taken into the system; while the lazy indolent ox deposits in abundance his superfluous carbon in the shape of fat. When we consider that anything which requires animal heat to be formed, or anything which causes exercise to be taken—as, for instance, allowing a fattening beast to be exposed to cold, or to take exercise, wastes the carbon of his food, it will be evident that it likewise prolongs the time he would take to fatten, and increases the quantity of food which he must consume. It is a curious fact that the deposition of fat is favoured by darkness.—p. 87, 88.

The ninth chapter, on "the food of plants," contains a store of facts of the highest interest to the agriculturist. Our limits compel

us to confine our extracts from this chapter to the following passage:—

A great deal of disappointment has often followed the application of these (saline) manures. This, however, is to be attributed to the improper manner in which they are applied. A man, for instance, has a field which yields an indifferent crop of wheat. We shall assume that the reason of this is, that his field is deficient in magnesia. By some lucky chance he applies Epsom salts, and he is rewarded with a most abundant crop. His neighbour likewise has a field which gives a bad yield of wheat; but, in this case, the reason is that he has exhausted his soil of phosphorus. However, as he has seen a large crop of wheat after Epsom salts, he applies them to his field. Of course his crop is not a whit better than it was before. And, instead of blaming his own ignorance, he blames scientific agriculture. He ought, of course, to find out that substance, or those substances, in which his soil is deficient, and apply them.—p. 124.

The tenth chapter is on "the food and digestion of animals," and is illustrated by several excellent wood-cuts. This chapter contains a great deal of matter applicable to the feeding of cattle; but we have not room for extracts. The eleventh chapter is on "the respiration of animals and plants;" the twelfth chapter on "animal and vegetable heat;" the thirteenth on "the external senses;" the fourteenth, a short one on "voluntary and instinctive motions;" the fifteenth, an equally short one, on "sleep;" the sixteenth, on "the reproduction of plants;" the seventeenth, on "the reproduction of plants;" the eighteenth, an interesting account of "the species and varieties of cultivated vegetables;" the nineteenth, on "the species and varieties of domesticated animals;" the twentieth, on "the death of animals and plants, and the action of poisons." We have hurried through the titles of these very instructive chapters to reach the appendix, to some parts of which we wish to draw the attention of our readers.

Among these, the chief is the "rotation of cropping." Under this head our author sets out with remarking, that the manner in which agricultural affairs are conducted in any particular locality, always did, and necessarily must, depend on three causes, namely, "the demand for food, the facility with which labour can be procured, and the supply of manure." In the first ages of man's history, the pastoral system of agriculture was the only one that was practicable: in this there was no cropping—"the husbandman moved about from one spot of natural grass to another with his flock of cattle and goats, the sources of his food, and his sole riches." When the art of raising a crop by sowing the seed came to be discovered, a like periodical change of locality at seed-time was practised, probably because it had been observed that the crop did not thrive for several successive seasons so well as at first; and in time the usage arose of sowing portions of the land under tillage after certain intervals of repose; to which usage the discovery was necessary, that after the expiration of a certain number of years, the previously cropped land returned to its former fertility. Previous to the knowledge of the use of manure, a number of years

would almost always be necessary to restore land to its original fertility. The introduction of manure into agriculture was a great epoch in its progress. The explanation, however, of its mode of action now adopted, was long posterior to the era of its first introduction. The explanation, as taught by modern agriculturists like Dr Kemp, is, that it serves to afford a new supply of that kind of food of which the previous crops have exhausted the soil. This explanation could not be given till chemistry arose to show the minute composition both of the soil and of the various plants which the husbandman cultivates. In the following verses, Virgil distinctly refers to the use of manure and to the utility of a rotation of crops; and if he had known that potassa is an essential constituent of plants in general, and that the ashes of the hearth, "cinerem immundum," which at that time, before the discovery of pit-coal, were exclusively wood-ashes, yield potassa abundantly by the mere addition of water, he would not have failed to explain the effect of wood-ashes on the growth of plants in the same manner as the moderns.

> Arida tantum
> Ne saturare fimo pingui pudeat sola; neve
> Effetos cinerem immundum jactare per agros.
> Sic quoque mutatis requiescunt fetibus arva.
>
> —*Georgicon*, I. v. 80.

After the introduction of manure, fallows were still necessary, owing to the scantiness of the supply. When contrasted, then, with this view, the old explanation, that manure acts as a stimulus or fertiliser, cannot hold its ground for a moment. Dr Kemp thus sums up this subject:—

Could the farmer procure as much excrementitious matter as would manure each of his fields every year, he might grow whatever crop he pleased as often as he pleased. He might, for instance, grow wheat upon the same field every year.

No farmer can, however, grow as much food as will enable him to keep so much stock as to have manure in sufficient abundance to manure each field every year. Many only contrive to give a sufficient manuring once in five or six years, while the very best are only able to do so about once in three years. This has rendered a rotation of cropping necessary to all present productive farming; that is to say, the farmer gives to a field a quantity of manure, which he gradually exhausts by three successive crops. After his crop of turnips, perhaps, he has as much potass, magnesia, phosphorus, &c., left in the soil as will afford him a good wheat crop. He has not as much of these left as will allow him to grow another crop of wheat; but still sufficient for barley, which requires these in less quantities, but which demands silica in a soluble state. The turnips and the wheat did not require much of this soluble silica, and therefore the barley can flourish.—p. 224-225.

After admitting that our knowledge of this subject is too recent to be quite accurate, and that there may be some still unknown circumstances which influence the rotation of cropping, Dr Kemp proceeds to show the very strong objections existing against the view taken by Decandolle—namely, that plants fail to grow in successive years in the same soil owing to excretions that take place from their roots, and which finally become poisonous to themselves.

Then follows an interesting notice of special manures; but our space is already exhausted, and we must part with Dr Kemp.

The book is portable—it is well got up—the print and woodcuts are in the very best style: in a small compass it contains a great amount of information on subjects of which no agriculturist should any longer be ignorant. The important knowledge which this work conveys is put forth in a concise, clear, and pleasing manner; and altogether we think the agricultural world is much indebted to Dr Kemp for the pains he has taken to place so much useful instruction before them.

Lime. From the French. By M. B.—There can be no greater proof of the importance attached to agricultural chemistry, than the multitudes of books which yearly issue from the press on this and kindred subjects, both in our own and in the various Continental languages. Though many of these works are but compilations, and some of them but a jumble of the opinions of other writers, still there are but few of them from which some information may not be gleaned. Having met with some sensible remarks on the action of lime in one of these works,* from the midst of a great deal of nonsense, we make the following extract:—

The properties of lime arise from the force with which it attracts carbonic acid from the atmosphere or soil to which it may be exposed. This attraction for carbonic acid is so powerful, that if lime be placed in contact with animal or vegetable matters, they are decomposed with great rapidity for the purpose of furnishing it.

It is for this reason that we see such good results from the application of lime upon soils where green crops have been consumed on the land, or where any of the various plants used for that purpose have been ploughed in green. It produces equally good effects, and for the same reason, in soils newly broken up; in fact, in all soils rich in vegetable matter. When this powerful decomposing action of lime is known, the necessity for caution in applying it upon land about to be sown becomes at once apparent. Time should be allowed for the lime to exhaust itself, or a sufficient depth of soil should be interposed between the lime and the seed, to protect the latter.

We cannot too strongly insist upon the fact, that the use of lime does not enable the farmer to dispense with the use of manure; on the contrary, the more lime is used, so much the more manure is necessary.

But the chemical action of lime is not confined to the decomposition of vegetable matters. It appears to be clearly established by the experiments of M. Fuch, of Munich, and those of Liebig, that this substance has also the property of setting at liberty the alkalies which are present in exceedingly small quantities in the soil, favouring the formation of soluble silicates, which are so useful to the cereals. The science of chemistry does not, as yet, explain to us how these decompositions take place; we only know that they do so. Such is briefly all that is at present known of the chemical properties of lime; and the perfect elucidation of the subject, the result of which would be the establishment of rules to guide the farmer in the use of lime, is well worthy the attention of the highest scientific attainments.

Lime, however, not only acts chemically, but, to a certain extent, it is also useful by altering the mechanical nature of the soil. For instance, it renders clay soils less tenacious; and it is also said (though we think erroneously) to make light soils firmer. This mechanical action of lime can, however, be but slight, as the tillage soil of the usual depth weighs nearly 1000 tons. Upon such a quantity, 5 or 6 tons of lime cannot produce any change which will be perceptible in the working of the land.

* *Chimie de Cultivateur,* par P. Joigneaux.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Rye. s.	d.	Pease. s.	d.	Beans. s.	d.
1850 Sep. 7	47	4	28	0	18	9	25	10	28	5	28	5
14.	46	1	24	2	17	3	28	0	31	0	27	7
21	46	11	27	8	19	8	28	1	32	1	28	8
28.	46	6	26	8	17	0	28	0	33	2	30	7
Oct. 5	46	1	26	11	18	4	28	0	34	10	30	0
12.	44	5	26	5	19	7	26	10	32	1	29	4
19.	43	2	27	2	17	0	28	3	33	9	30	9
26.	42	8	26	4	17	2	25	7	32	11	28	8
Nov 2.	41	10	26	11	19	1	23	10	31	3	29	0
9.	44	0	26	10	17	6	26	1	30	11	28	1
16.	44	5	26	5	18	0	25	6	30	7	29	10
23.	43	0	26	9	18	1	25	2	29	11	31	3
30.	45	4	27	6	18	0	25	4	31	9	29	2

EDINBURGH.

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Pease. s.	d.	Beans. s.	d.
1850. Sep. 4.	40	6	23	8	20	11	28	6	28	11
11.	41	2	23	7	19	10	29	0	29	4
18.	42	1	22	7	20	3	28	8	29	3
25.	42	11	23	3	20	0	29	2	29	10
Oct. 2.	42	11	23	8	19	10	30	6	32	1
9.	42	8	24	11	20	8	32	0	32	7
16.	42	7	25	6	20	6	34	6	35	7
23.	43	9	26	1	20	4	33	7	34	1
30.	43	1	25	9	19	1	32	2	32	8
Nov. 6.	41	8	25	4	19	3	30	0	30	5
13.	40	7	24	9	19	0	29	6	30	2
20.	41	2	25	5	18	5	28	9	29	5
27.	41	0	24	11	18	1	29	8	30	4

LIVERPOOL.

Date	Wheat s.	d	Barley s.	d.	Oats. s.	d.	Rye. s.	d.	Pease. s.	d.	Beans. s.	d.
1850. Sep. 7	42	3	24	2	17	3	23	2	27	2	29	1
14.	41	6	24	6	16	6	23	10	27	6	29	6
21	41	10	24	10	16	8	24	0	28	1	30	2
28.	41	1	25	6	19	2	24	4	29	2	31	3
Oct 5.	40	9	26	6	17	7	25	8	29	6	32	4
12	39	4	27	7	17	10	26	6	27	0	33	0
19	39	2	26	8	16	6	26	0	27	6	32	1
26.	39	8	26	2	16	2	25	8	28	4	30	10
Nov 2.	39	1	26	0	17	0	25	3	29	0	29	9
9	39	10	25	10	17	9	24	7	28	10	29	2
16	40	1	25	4	17	1	24	4	28	0	28	6
23.	39	4	24	9	17	2	24	9	29	0	29	8
30.	39	4	25	0	17	3	24	1	29	11	26	10

DUBLIN.

Date.	Wheat, p. barl. 20 st. s.	d.	Barley, p. barl. 16 st. s.	d.	Bere, p. barl. 17 st. s.	d.	Oats, p. barl. 14 st. s.	d.	Flour, p. barl. 1 cwt. s.	d.
1850. Sep. 6.	22	3	10	4	8	9	8	9	14	4
13.	22	5	10	5	8	10	8	10	14	6
20.	22	11	11	10	9	3	9	0	14	4
27.	23	0	11	9	9	10	8	9	14	7
Oct. 4.	22	1	11	6	9	6	8	8	14	3
11.	21	10	11	4	9	2	8	7	14	2
18.	21	9	11	4	9	4	8	9	14	1
25.	21	9	11	6	9	6	8	11	14	1
Nov. 1.	21	10	11	5	9	6	8	10	14	2
8.	22	2	11	8	9	6	9	1	14	0
15.	22	8	11	10	10	0	9	6	14	0
22.	23	0	12	0	9	10	9	9	15	0
29.	22	11	12	3	9	9	9	4	14	10

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date	Wheat. Weekly Average. s.	d.	Wheat. Aggregate Average. s.	d.	Barley. Weekly Average. s.	d.	Barley. Aggregate Average. s.	d.	Oats. Weekly Average. s.	d.	Oats. Aggregate Average. s.	d.	Rye. Weekly Average. s.	d.	Rye. Aggregate Average. s.	d.	Pease. Weekly Average. s.	d.	Pease. Aggregate Average. s.	d.	Beans. Weekly Average. s.	d.	Beans. Aggregate Average. s.	d.
1850. Sep. 7	43	2	43	7	23	0	22	7	17	11	18	0	25	4	23	1	27	10	27	0	28	9	26	6
14.	42	10	43	5	23	9	22	10	17	4	17	10	26	10	23	10	28	9	27	2	29	7	28	6
21	42	7	43	2	24	10	23	3	17	1	17	8	26	4	24	3	29	5	27	7	29	5	28	10
28.	42	8	43	0	24	8	23	7	16	10	17	5	26	4	24	10	30	0	28	2	29	5	29	0
Oct 5.	42	2	42	10	24	5	23	10	16	8	17	3	26	7	25	10	31	3	29	0	29	6	29	3
12.	41	2	42	5	24	2	24	2	17	1	17	2	25	6	26	2	29	7	29	6	29	6	29	4
19.	39	10	41	10	24	2	24	4	16	7	16	11	26	7	26	5	29	5	29	9	29	7	29	6
26.	39	9	41	4	24	0	24	5	16	8	16	10	25	1	26	1	30	6	30	0	28	10	29	4
Nov. 2.	40	2	40	11	24	1	24	3	17	3	16	10	23	6	25	8	29	2	30	0	29	1	29	4
9.	40	5	40	7	24	4	24	2	17	0	16	10	26	7	25	8	29	11	30	0	29	0	29	3
16.	39	1	40	2	24	1	24	2	17	2	16	11	24	2	25	3	29	0	29	7	28	9	29	1
23.	39	11	40	0	24	1	24	2	17	3	17	0	20	6	25	11	29	4	29	7	28	9	29	0
30.	40	3	40	1	24	6	24	2	17	1	17	1	26	3	25	5	29	2	29	6	28	6	28	10

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1850.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Sep. ..	Danzig	38 0 - 43 6	14 0 - 18 0	12 0 - 15 6	17 6 - 22 6	20 6 - 26 0	18 9 - 25
Oct. ..	Danzig	35 6 - 43 0	14 6 - 18 0	11 0 - 14 0	15 6 - 20 6	21 6 - 27 6	21 6 - 28
Nov. ..	Danzig	34 6 - 42 0	14 6 - 18 0	9 6 - 12 6	15 0 - 20 0	20 0 - 25 0	20 0 - 26
Sep. ..	Hamburg	40 0 - 46 0	20 0 - 28 0	14 0 - 17 6	21 6 - 28 0	21 0 - 26 6	26 6 - 31
Oct. ..	Hamburg	37 6 - 43 6	19 0 - 26 6	13 0 - 16 6	22 6 - 29 0	23 6 - 28 6	24 0 - 27
Nov. ..	Hamburg	34 0 - 41 0	18 0 - 25 6	12 6 - 14 6	20 0 - 27 0	22 0 - 28 0	20 0 - 24
Sep. ..	Stettin	36 6 - 41 6	14 6 - 19 6	10 6 - 14 6	18 6 - 24 6	22 6 - 28 0	23 6 - 29
Oct. ..	Stettin	35 0 - 41 6	14 0 - 18 0	10 0 - 12 6	19 6 - 25 0	23 6 - 29 0	24 0 - 30
Nov. ..	Stettin	33 6 - 38 0	13 6 - 18 6	9 6 - 11 0	20 0 - 26 0	21 0 - 27 6	20 6 - 25
Sep. ..	Königsberg	34 6 - 42 0	13 6 - 17 6	10 6 - 13 0	16 6 - 21 6	22 6 - 26 6	24 6 - 28
Oct. ..	Königsberg	35 0 - 38 0	12 9 - 17 0	10 0 - 12 6	17 6 - 22 6	21 6 - 26 0	22 6 - 23
Nov. ..	Königsberg	32 6 - 37 0	12 6 - 17 0	9 6 - 11 0	18 6 - 24 0	20 6 - 25 0	22 0 - 25

Freights from the Baltic from 2s 3d to 3s 6d; from the Mediterranean, from 5s 6d to 8s 0d; and by steamer from Hamburgh, 2s 0d to 2s 6d.

THE REVENUE.—From 10th October 1849 to 10th October 1850.

	Quarters ending Oct. 10. 1849.	Quarters ending Oct. 10. 1850.	Increase.	Decrease.	Years ending Oct. 10. 1849.	Years ending Oct. 10. 1850.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs....	5,253,272	5,251,883	..	1,389	18,657,563	18,738,805	81,242	..
Excise......	4,287,577	4,103,343	..	184,234	12,381,916	12,913,102	531,186	..
Stamps.....	1,686,747	1,507,028	..	179,719	6,328,213	6,145,780	..	182,433
Taxes......	203,057	186,613	..	16,444	4,326,901	4,335,086	8,185	..
Post-Office..	224,000	227,000	3,000	..	852,000	820,000	..	32,000
Miscellaneous	41,902	48,727	6,825	..	342,543	376,569	34,026	..
Income Tax	1,914,006	1,867,864	..	46,142	5,383,199	5,413,701	30,502	..
Total Income	13,610,561	13,192,458	9,825	427,928	48,272,335	48,743,043	685,141	214,438
		Deduct Increase		9,825	Deduct Decrease		214,438	
		Decrease on the qr...		416,103	Increase on the year		470,703	

TABLES OF BUTCHER MEAT.—Per Stone of 14 Pounds.

Date.	London. Beef.	London. Mutton.	Liverpool. Beef.	Liverpool. Mutton.	Newcastle. Beef.	Newcastle. Mutton.	Edinburgh. Beef.	Edinburgh. Mutton.	Glasgow. Beef.	Glasgow. Mutton.
1850.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Sep. ..	6 6 - 7 0	6 6 - 7 3	4 6 - 6 0	5 6 - 7 0	4 6 - 6 0	5 0 - 7 0	5 3 - 6 6	5 0 - 6 9	5 3 - 6 6	5 6 - 6 6
Oct. ..	6 0 - 6 9	6 0 - 7 0	4 9 - 6 3	5 6 - 7 0	4 0 - 5 6	4 6 - 6 0	5 0 - 6 6	4 9 - 6 10	5 0 - 6 3	5 6 - 6 9
Nov. ..	5 6 - 6 9	6 0 - 7 0	4 6 - 6 0	5 3 - 6 9	4 6 - 5 9	4 6 - 5 9	5 0 - 6 3	5 0 - 6 6	5 3 - 6 6	5 9 - 7 0

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

English.	s. d. s. d.	Scotch.	s. d. s. d.
Merino,	12 6 to 18 0	Leicester Hogg,	10 6 to 16 0
.. in grease,	9 6 to 14 0	.. Ewe and Hogg,	9 0 to 12 6
South-Down,	13 0 to 17 6	Cheviot, white,	11 0 to 15 0
Half-Bred,	10 6 to 13 6	.. Laid, washed,	8 6 to 11 6
Leicester Hogg,	10 6 to 16 0	.. unwashed,	6 3 to 8 3
.. Ewe and Hogg,	9 0 to 13 6	Moor, white,	6 0 to 7 0
Locks,	6 3 to 8 6	.. Laid, washed,	5 9 to 6 9
Moor,	5 3 to 7 3	.. unwashed,	5 3 to 6 3

IRRIGATION.

By T. ROWLANDSON, London.

THE question of extending the practice of irrigation has recently received an additional impetus, in consequence of its having formed a prominent subject of examination at the late meeting of the Royal Agricultural Society of England, held at Exeter in July last. Another matter—and possibly of greater ultimate importance—has also, within a short period, been introduced to the notice of agriculturists, by Professor Way and H. S. Thompson, Esq., viz.,—"the absorbent power of soil in fixing salts of ammonia, potash," &c. The subject last-mentioned appears to account, in a great measure, for a number of circumstances hitherto unexplained, and doubtful in reference to the sources from whence the fertilising effects of irrigation are derived. As the experiments of these gentlemen have a much wider range and adaptation to practical application in the management of the farm than to mere irrigation, it will be of considerable use to the farmer to give a brief summary of the experiments made by them; for they are interesting for their novelty, and also for in some degree subverting many previous opinions which have heretofore been considered as well established. The practical utility of their application is beyond question, and would justify more lengthened extracts.

Mr Thompson's experiments were made in the summer of 1845,* and were instituted in consequence of the then very general endeavour that was made to prevent the escape of ammonia from tanks and manure-heaps, by means of sulphuric acid, gypsum, sulphate of iron, &c., and also in consequence of observing the waste of volatile and soluble fertilisers which occurred in ordinary farm-practice, by casting manure into large heaps some months before applying it to the land—it being desirable to ascertain whether the manure might be ploughed into the soil any time during the winter without loss, and immediately on its removal from the yard. In making the experiments, glass percolators were used, 2¼ inches in diameter; and a portion of the soil of a cultivated field (a light sandy loam of good quality, lying on new red-sandstone) was placed in two of the percolators to the depth in each of them of 6 inches. They were labelled A and B. The soil was moist, but not wet. Ten grains of sulphate of ammonia, dissolved in ten drams of distilled water, were intimately mixed with the soil A. Ten grains of the sesquicarbonate of ammonia were similarly mixed with B. In order to ascertain the effect that might be produced by a heavy rain, 8 ounces of water were slowly poured on the surface of

* Part I. of Vol. II., *Journal of Agricultural Society of England.*

A and B. A considerable portion of this was retained by the soil, and, as it appeared, after 4 ounces had passed through, that little more was likely to immediately follow, these 4 ounces were experimented on, and were found to yield—

A. Gypsum,	4.0 grain.	B. Gypsum,	1.0 grain.
Sulphate of ammonia,	2.4 —	Muriate and sulphate of ammonia,	1.3 —
Other sulphates,	.6 —		

In order to test the absorbent powers of the soil when carried on under favourable circumstances, portions of the same soil were placed in the percolators to the depth of 8 inches. Ten grains of sulphate of ammonia, and a similar quantity of sesqui-carbonate were similarly mixed in the different portions. Three fluid ounces of water were placed on each, and two similar additional quantities were added at intervals of three hours. The whole of the filtered liquid was returned upon the soil at the end of twelve hours; and when it had again passed through the soil, successive portions of water, amounting to 8 ounces more, were passed through. The results were, that, on evaporating and analysing the solid matters, they were found to consist as follows:—

A. Sulphate of lime,	6.3 grain.	B. Sulphate of lime,	0.1 grain.
Muriate of magnesia,	1.0 —	Muriate of lime and magnesia,	2.5 —

The next soil operated on was a specimen of black soil, (from the bottom of an old stick-heap,) consisting chiefly of decayed vegetable matter, in like quantities, and salts of ammonia were similarly treated with the preceding, and produced the following results:—

A. Sulphate of lime,	5.8 grain.	B. Sulphate of lime,	0.8 grain.
Silica,	0.3 —	Silica,	0.2 —
		Salts of ammonia,	3.8 —

In a fourth experiment, where a strong clay soil was used, a difficulty occurred in consequence of the slowness with which the water penetrated the soil—nearly three weeks having elapsed before 3 ounces had passed through, which, on analysis, were found to consist of—

A. Sulphate of lime,	1.0 grain.	B. Organic matter,	0.5 grain.
Organic matter,	0.5 —	Trace of ammonia.	
Trace of ammonia.			

The length of time which elapsed, and the small quantity of water which percolated in the last experiment, are pretty evident proofs that the ammonia had become fixed in the soil.

In another experiment, the soil used in the first and second experiments was spread out in a thin layer, and dried at a temperature of 200°. With this the percolators were filled to the depth of 8 inches whilst hot, and treated respectively as in the first experiment. The soil, being dry, retained a large portion of the water, but $2\frac{1}{2}$ ounces were obtained to operate on, and yielded.

A. Sulphate of lime, . . . 1.2 grain. Sulphate of ammonia, . 0.1 —	B. yielded only a trace of ammonia and organic matter.

In the experiments made by Professor Way, it was invariably found that the salts of ammonia became fixed in the soil wherever clay was present. In order to strengthen the above facts, I may here mention what came under my own observation in the course of an inquiry respecting the supply of the town of Liverpool with water. All parties in Liverpool had agreed upon the necessity of obtaining an additional supply; but as to the mode of obtaining it there existed a serious division amongst its inhabitants—one party being for obtaining the water from wells in the vicinity, another for procuring it from hills 25 miles distant. Robert Stephenson, Esq., M.P., the celebrated engineer, was appointed arbitrator, and having paid considerable attention to the subject, I was called on to assist in the inquiry; and in the course of an interview it was remarked by Mr Stephenson, that in the analysis of the different wells, all the shallow wells (about 100 feet deep) were invariably "*harder*" than the waters which issued from deep borings, which have obtained the title of artesoid springs. All these springs agreed in standing at about 5 degrees of hardness—the same as was found to be the case in wells sunk in the open country around Liverpool; but the average of the Liverpool shallow wells was 16 degrees of hardness. After giving the matter some consideration, and reflecting upon certain circumstances which occurred to me in the course of reclaiming some waste land in Ireland, I ventured upon uttering an opinion, that the cause of the increased hardness of the water in the shallow wells arose from a decomposition which took place from sewer and other waters polluted with the elements of ammonia. Were this not the case, the water from the greatest depths ought to have proved the hardest. I mention this fact as showing that, on the great scale, the same phenomena take place that are exhibited in the laboratory, and therefore perfectly justify the adoption of those means which science points out as best calculated to secure to the cultivator of the soil the utmost advantages which this valuable discovery is likely to confer on the farmer. Amongst the most conspicuous is the circumstance that soils containing clay may be manured during winter or any convenient period, provided it is well intermixed with the soil, without any danger of its fertilising properties being abstracted by rains, to the detriment of the succeeding crop.

In the valuable paper of Professor Way, published in the Number of the Journal of the Agricultural Society of England already referred to, there are detailed some very elaborate experiments of this absorbent property of soils for manures. The greater part of the experiments were made with a red loam from the estate of P. Pusey, Esq., M.P. Several of the experiments were repeated at a public lecture at which the writer was present,

and the experiments were perfectly satisfactory. At a period when so much attention is drawn to the drainage of towns, and the possible application of sewerage to agricultural purposes, the following extract of the experiments on London sewerage water is particularly interesting:—

The sewerage water employed had the following composition:—

	An Imperial Gallon contained, in Grains,		
	Soluble.	Insoluble.	Both.
Organic matter and salts of ammonia, .	121.50	180.32	301.82
Sand and detritus from the streets, .	*1.39	19.30	20.69
Soluble silica, ...	1.57	10.94	12.51
Phosphoric acid, ...	7.71	2.73	10.44
Sulphuric acid, ...	10.71	4.02	14.73
Carbonic acid, ...	11.62	3.97	15.59
Lime, ...	7.50	17.03	24.53
Magnesia, ...	2.87	Traces	2.87
Peroxide of iron, and alumina, . .	Traces	6.20	6.20
Potash, ...	46.91	1.22	48.13
Soda, ...	None	1.51	1.51
Chloride of potassium, ...	None	None	None
Chloride of sodium, ...	31.52	1.72	33.24
Total, . .	243.30	248.96	492.26

It also contained nitrogen, the greater part of which existed in the form of ammonia, whilst a small portion was present in the solid animal and vegetable matter of the sewer water.

Ammonia in a gallon 41.28 grains, of which 36.72 actually *existed* as ammonia.

The filter through which the sewer water was passed, consisted of 4 lb. of Mr Pusey's soil placed in a glass cylinder, which it filled to the depth of six inches. The liquid began to pass through in about ten minutes, and in two hours about half a gallon (5 lb.) was collected. The filtration had deprived it of colour and smell. The insoluble matter of the sewer water was of course arrested mechanically, being in great part found as a black slime on the top of the soil. Upon analysis, a gallon of the filtered liquid was found to contain 248 grains of solid matter, consisting of

	Grains.
Organic matter destitute of Nitrogen, ...	60.58
Chloride of Sodium, ...	52.73
Chloride of Magnesium, ...	.67
Chloride of Calcium, ...	8.89
Carbonate of Lime, ...	104.98
Sulphate of Lime, ...	17.49
Loss on the analysis, ...	2.66
	248.00

The filtered liquid contained no potash, no ammonia, or nitrogen in any form, no phosphoric acid, and a much reduced quantity of magnesia. Of this experiment it is remarked, by Professor Way, that the total solid contents of a gallon of sewer water is *greater* after filtration than before, due to the presence of a large quantity of carbonate of lime, which seems to have been dissolved by the free carbonic acid generated in the sewer water, by the gradual decomposition of its organic contents.

* Stated to be a small portion of insoluble escaping the linen filter, and properly belonging to the other column.

It is further remarked that, independently of the matters which are mechanically arrested, it is found that the soil retains the greater part—in most cases the whole—of those ingredients of manure upon which we are accustomed to place the most value. Of the enormous extent of this absorption it is remarked, by Professor Way, that it is equal to a weight of sewerage water greater than the weight of the soil; and how much further we know not, because the experiment was not carried beyond.

If, in practice, every portion of the soil of an acre of land could have been brought into activity as a filter for the sewerage water, and the saturated soil 10 inches deep, 1000 tons or 224,000 gallons of undiluted sewerage water, might be thrown upon it, and the water would pass away by drains, deprived of its principal manuring properties.

One thousand tons, or 224,000 gallons of sewer water, contains by the preceding analysis about half a ton of real ammonia, besides other fertilising substances, as potash, phosphoric acid, &c., or equivalent to manuring an acre of land with 3 tons of Peruvian guano—which is twenty times the quantity actually used.

In the above case, it must be understood that the soil must be in the most favourable condition for developing its absorptive powers, minute mechanical division being one of the principal circumstances to be attended to. Thus a strong clay soil, in practice, may possess a less absorptive power than the same clay mixed with an equal weight of sand; though the clay *per se* would have the greater power, if mechanically divided in an equal degree.

These experiments are very useful, as giving scientific evidence of the correctness of the practice of placing layers of clay in manure-heaps, and under cattle, for the purpose of absorbing and fixing the valuable constituent of manure. That soils should, particularly such as contain a notable proportion of alumina, possess such enormous powers of absorbing and fixing the valuable ingredients of plants—such as ammonia, phosphoric acid, potash, &c.—whilst their decompositive causes, the soluble salts of lime and magnesia, should be washed out, is a fact of the highest importance. It may also be stated that choloride of sodium is a salt which is not retained. It fortunately happens that all these can be procured in abundance, and at a cheap rate; and only small quantities are required for any crop—if we except carrots and mangold-wurzel, which require relatively a considerable weight of common salt. On our western coasts, the sea-breezes supply an adequate quantity to the land; and the eastern coasts and the interior can be supplied with the article at a very low rate per acre.

The importance of the experiment just noticed, in reference to many practices in general agriculture, particularly in relation to the application of manures, is too obvious to need further comment; we shall, therefore, in the future part of this paper, confine our observations to this absorptive property of soils for manure, in explanation of the cause why fertilising effects follow a well-regulated and properly constructed system of irrigation.

The introduction of irrigation is usually, but improperly,

attributed to the Egyptians, who cut canals for the purpose of distributing the muddy water of the Nile. This process, however, properly belongs to warping. The sandy plains of ancient Assyria were probably the country where irrigation was first practised. From these ancient kingdoms the practice extended into Europe. The Greeks and Romans were acquainted with the maxims of the elder Cato, which on this subject have been handed down to us, "*Prata irrigua, si aquam habebis, potissimum facite; si aquam non habebis; sicca quam plurima facite.*"—If you have water, irrigate as many meadows as possible; if you have not water, make as many dry meadows as you can. Cato also held the opinion that the way to become rich was by grazing cattle; hence he gave a preference to meadows. In doing so, however, he did not maintain that grass is the most valuable crop that the land can produce, for he only placed meadows on the fifth degree of value.

One of the earliest theories respecting the *modus operandi* of water irrigation acting as a fertiliser in properly constructed water-meadows, is the higher temperature at which the roots and blades of grass are maintained during winter. A very high authority, Sir H. Davy, decided in favour of this opinion, remarking that water is of greater specific gravity at 42° than at 32°, the freezing point; hence, in a meadow irrigated during winter, the water immediately in contact with the grass is rarely below 40°—a temperature not at all prejudicial to the living organs of plants. He says, "In 1804, I examined the temperature of a water-meadow near Hungerford, in Berkshire, by a very delicate thermometer. The temperature of the air at seven o'clock in the morning was 29°. The water was frozen above the grass. The temperature of the soil below the water, in which the roots of the grass were fixed, was 43°." The idea that the warmth produced, or induced on a meadow, by a thin covering of water, was a principal cause of its subsequent luxuriance is a very ancient one, for Pliny mentions, (vol. i. cap. 26), "That in the territory about Sulmo, in Italy, within the liberties of Fabianum, the vines which do bear the harder and sourer grapes must of necessity be watered; and no marvel, for the very lands and corn-fields use to have water let into them. The manner is, in mid-winter to open a sluice or draw up their floodgates, for to overflow their vine roots with the river; and so much the rather, if either it be a hard frost or snow lie deep upon the ground. And why so? Because the pinching cold should not burn them. And this they call by the name of *Tepidana*, (that is, to give them a kindly warmth as in a stove.)" That the increased warmth here noticed is one important cause of fertility is pretty certain; but it is not the only cause, for the water must be in constant motion, otherwise a fertile meadow would be converted into a morass. At a subsequent stage of the inquiry this subject will be again referred to.

It is not intended, in the course of this paper, to give any

plans respecting the construction of water-meadows; for these the reader is referred to the works of Messrs Boswell, Wright, and Stephens.* The two former works are now only to be found in libraries; the latter is still in print. It may, however, be stated, that irrigated lands are commonly divided into two classes —viz., bed-work and catch-work meadows. To these a third may be added, to which the title of flat-work has been given. The last is a common mode in Devonshire. The title is, however, an inappropriate one, the meadows being only apparently flat.

The following is a brief description of each mode. The bed-work method is the most perfect, but, at the same time, the most costly method—it being perhaps a low average to estimate the cost at less than £20 per statute acre; whilst, in one instance—viz., the Clipstone water-meadows—constructed by the Duke of Portland, have cost more than £130 per acre, the expenditure on their construction, from 1816 to 1837, being as follows:—

Levelling ground, forming carriers, draining, &c. . . .	£32,874	5	7
Draining, only since 1832, ...	1,206	9	4
Bridges, sluices, stop-gates, ...	5,216	6	2
	L.39,297	1	1

The preceding details respecting the Clipstone meadows, as well as what follows, is extracted from the excellent account given by J. E. Dennison, Esq., M.P., in the first volume of the *Journal of the Royal Agricultural Society of England.* The following extract of the estimated annual produce and value, will show that even this enormous outlay on 300 acres of land has been highly remunerative.

PRODUCE OF AN ACRE.

Keeping from January 1st to end of March, 2 ewes and lambs—the 2 lambs sold fat, at L.1, 4s. each, .	L.2 8 0	
Deduct shepherd's wages, ...	0 6 0	
		2 2 0
From April 1st to end of July, twice cut green 18 loads of green fodder, each cutting—total 36 loads, at 7s. per load, ...	12 12 0	
Deduct expenses, mowing and carting—2s. 6d. per load,	4 10 0	
		8 2 0
Eddish, ...		1 10 0
		11 14 0
Or if mown for hay—		
2 tons of hay at L.3 per ton, ...	6 0 0	
Deduct expenses, ...	1 0 0	
		5 0 0
In this case, as the land would be pastured so much later through April and May, it would feed 4 lambs fat instead of 2—4 lambs at 2s. 4d., ...	4 16 0	
Deduct shepherd's wages, ...	0 12 0	
		4 4 0
Eddish, ...		1 10 0
Total,		10 14 0

* *The Practical Irrigator and Drainer.* By GEORGE STEPHENS. William Blackwood & Sons.

Nothing is here charged for the cabbages brought on the land to assist the early ewes and lambs. The 600 stock, ewes and lambs, kept on the meadows during the same time, are set off against this expense.

It is, however, remarked by Mr Dennison "that the value of these meadows cannot by any means be estimated by the worth of their own produce alone, however large that may be, their collateral benefits are so great—requiring themselves no manure but the water. They afford, through the cattle fed in yards on their produce, such a weight of manure for other land that large districts have by these means been brought into profitable cultivation; and though the water itself only runs over 300 acres, it may be said to enrich four times that extent. And, again, by the early food they supply in the spring, stock can be kept off the young seeds till they have gained a head; which is a most important advantage on a farm, and one that, if a dry summer should follow, can hardly be too highly appreciated." Taking these circumstances into consideration, he estimates the annual value of the Clipstone meadows at £3660—as follows:—

Taking the total quantity of meadow at 300 acres, and the mean value at L.11, 4s. per acre, this would give a yearly value of, .	L.3360
Value of the manure produced for the arable part of the farm at, .	200
And the saving, by allowing the seeds to become a full pasture before they are stocked in the spring at, ...	100
The total annual value would be, ...	L.3660

Which, divided by 300, the number of acres, would give an annual value per acre of L.12, 4s. From which deduct wages of superintendence and two men, amounting to about 10s. per acre, it would bear L.11, 4s. per acre—taxes and assessments not deducted.

Of the above estimates it may be remarked, that the value of hay for feeding purposes is rated too high by 10s. a ton at least. It ought also to be stated, that the water used at Clipstone receives the benefit of the town drainage of Mansfield. On the other hand the outlay per acre has been unprecedently enormous; and the result proves that irrigation is a secure remunerative investment of capital, if carried on with ordinary foresight and economy. The weighing all the circumstances which should be considered, prior to determining on investing capital in expensive bed-work irrigation, requires a much greater amount of general scientific knowledge than is usually acknowledged to be necessary; in degree, the same remark also applies to catch-work and irrigation on the flat.

The great expense attending bed-work irrigation is caused by the necessity of levelling the whole of the field intended to be converted into a water-meadow, so as to give the beds or panes a uniform descent. In very undulating land this becomes exceedingly expensive. The beds or panes are low ridges in the field artificially formed, having a cutting called the feeder in the ... each ridge, for conveying the water on to the land; and a

drain in the hollow for carrying the water away after it has passed over the land. The most approved size is to make the distance between the feeder and the drain equal to 4 yards, thus constituting what is termed an 8 yard or 24 feet pane. In fields of irregular form and inclination these proportions will, of course, often vary. The flow of water in the feeders is regulated by stops, which may be formed of boards or earthen sods. It is the province of the person who superintends the meadows, when irrigated, to adjust these stops in such a way as to maintain an equal current over the meadow.

Catch-work meadows are formed when the inclination of the plane of the surface is considerable, and is generally, and on hill-sides particularly, where the supply of water is abundant—which is generally the case on the sides of hills. In this case, the first feeders is formed at the highest practical level, being in fact only a small trench cut for the purpose of conveying the water on to the land, the rapidity or slowness being regulated, as in the former instance, by stops. The water descends by the natural force of gravitation to the next trench cut parallel to the top one, the latter acting as feeder and drainer; then parallel trenches are constructed, at intervals of about 30 feet, throughout the field. Catch-work irrigation can frequently be executed for £2, 10s. per acre; and in many places would be found highly advantageous from the benefits to be obtained, similar to those detailed in the account of the Clipstone meadows.

Irrigation on the flat or the Devonshire practice is a modification of the catch-work and bed-work methods, differing from both, yet combining some of the essentials of each. It is not so perfect a plan as the bed-work, but has the advantage of being much less costly, being commonly executed for £3 or £4 per acre. In this mode there are occasionally trenches constructed which perform the respective offices only of drains or feeders; but where it can be done—and this frequently occurs midway between the highest and lowest points of the meadow—the trench is used in both capacities. In bed-work irrigation, the feeders and drains lie parallel to each other, and in right lines; in flat-work these lines are formed in all sorts of sinuosities, and the distances from each other have only reference to the character of the ground. The main feature of this mode consists in carrying the water over the highest sinuosities of the meadows, in such a manner that the irrigator will be enabled at intervals, according to the nature of the ground, so to construct his other conduits and drains as to throw the water in succession over every part of the meadow, and at the same time that the drains shall carry off the water as quickly as it flows on the land. Without having witnessed the process, it could scarcely be conceived with what facility an apparently flat meadow may be irrigated, and then laid dry at the will of the proprietor. The whole art lies in taking

advantage of the natural inequalities of the field. I found, however, that at the water meadows of Sir Thomas Dyke Ackland, Bart, M. P., at Killerton, that if the angle of inclination was less than 3° the water was apt to stagnate, and produce prejudicial effects. It may, however, easily be conceived that, whilst the average inclination of the field might not amount to one-tenth of that angle, many undulations might exist with declivities equal to it; and, whilst it would require the greater angle to cause the irrigating fluid to flow with sufficient velocity to prevent injury arising to the herbage, the water would flow off with sufficient facility by means of an open trench having the lesser inclination. It would be difficult to make the reader understand the process, even with the aid of a diagram—without one it is impossible; the process should be seen in action to be properly understood. In flat-work water-meadows, small elevations and hassocks are levelled with the spade and thrown into any depressions that may exist. In executing this work, the horse-shovel (*mouldebart* of the Flemings and levelling-box of the Scotch,) might be used with advantage, with less cost and greater expedition than hand labour.

The advantages to be derived from the more general construction of water-meadows would doubtless be very great, both in an individual and a public point of view. One of these great advantages has of late years become relatively of less importance,—viz, the early spring food which they produce—the want of early spring food being in many instances, at the present period, more than compensated by the heavy green-crops grown in the course of an alternate course of husbandry. It happens, however, that on some of the dry arenaceous downs of Wiltshire and Dorsetshire, where irrigation has been the longest established in Britain, the climate and soil are unsuitable to the growth of those green-crops on which the north of England and Scottish farmer more particularly depend for spring food; and in March and April, winter tares are not ready. In such situations it is therefore indisputable that the value of the early food produced by water-meadows, especially for the use of ewes and lambs, is invaluable. Where swedes can be procured in abundance, the benefit is by no means so great, and must be estimated like any other crop—viz., from its relative produce and cost—and not from any peculiar value which it may have for affording a supply of food at a critical period of the year.

In constructing water-meadows, many circumstances ought to be taken into consideration before either a proprietor or tenant resolves on any outlay of capital; otherwise, after all the trouble and expense have been incurred, the result may prove unprofitable. The character of the soil, the quality of the water, and peculiarity of the climate of the locality, are the principal circumstances which should be always held in view—to which might be added an innumerable amount of subsidiary ones; and

the whole should have reference to the peculiar nature of the husbandry of any particular farm or locality.

As a general rule, irrigation will be found most serviceable on arenacious soils, and in dry climates; hence its peculiar value in Wiltshire and Dorsetshire. Much, however, will depend upon the character of the water. On this point the most conflicting testimony exists. The Devonshire practice is to take a little of the water intended to be used in the palm of the hand, and if it "*feels soft and oily*" to pronounce it good; if harsh, or, as it is usually termed, *hard*, to denounce it as unfit. On the other hand, there are parties who ask, Does it grow good water-cresses? and if the answer is in the affirmative, it is averred that the water must be hard, as water-cresses are known to grow well in streams containing lime. Now, that water-cresses may grow in streams that are relatively soft is perfectly reconcilable; whilst, on the other hand, that hard water may prove of a highly fertilising quality is equally correct. As a popular instance of the latter, we need only refer to the circumstance that streams are invariably found to be more useful as irrigants after passing through and receiving the sewerage of towns. The water-meadows near the city of Winchester, and the Clipstone meadows near Mansfield, are cases in point. Now sewerage water is invariably hard, in consequence of containing so large a proportion of lime and magnesian salts in solution. The London sewer water, of which the analysis was previously given, would probably indicate, by the soap test, about sixteen degrees of hardness. It is evident, therefore, that either the oily soft feel of water when placed on the palm of the hand, or the luxuriant growth of water-cresses, is a very fallible test of the value of springs for irrigating purposes—the sole test being a chemical analysis. If the water intended to be used contains all the inorganic constituents of grass, and still better, if it contains a nitrogenous compound, the water may be pronounced well calculated for the intended purpose; if deficient in any one or more mineral constituents of grass, the missing ingredients must be sought for and procured from the soil, otherwise the application of water will prove a failure. In describing the water-meadows at Killerton, these circumstances will be again referred to; it was, however, deemed requisite to advert to the rude methods of estimating the value of water for irrigation, as it will be found that all the Devonshire *practical* irrigators—which definition, when properly construed, signifies men who are obstinate in holding their own rude estimate in opposition to plain and well-ascertained scientific facts—a property generally appertaining to untutored and comparative ignorance. As it is highly probable that the practice of forming irrigated meadows will become much extended, in consequence of the attention that has recently been drawn to the subject by the Royal Agricultural Society of England, the above remarks are necessary, by way of caution to

intending irrigators, otherwise these may be led into expense to no good purpose, by such practical men as those referred to, as was the case about fifty years ago, when irrigation became a fashionable rage with landowners. On this point, the remarks of the celebrated Arthur Young, in his *Agriculture of Suffolk*, is commended to the attention of intending irrigators, in which he comments severely on the abuses committed in his neighbourhood by uninstructed but *practical men*, who disdained the use of a spirit-level or any artificial aid, in laying out the ground.

The water-meadows at Killerton are singularly instructive, in consequence of their presenting almost every feature connected with the question of irrigation; in therefore giving a somewhat minute detail of their situation, character, &c., the whole of the circumstances which ought to be kept in mind when laying out water-meadows will pass under review.

The Killerton water-meadows are situated in a vale lying between some low hills of red sandstone. To the naked eye these meadows appear almost flat—so much so are they in fact, that, prior to their being thorough-drained, the whole were covered with a fine crop of rushes, the hollows being in a great measure filled up with peat, formed by the decay of aquatic plants. The upper meadows, on which the water flows in the first instance, is generally composed of a light sandy soil, of a red colour, with patches of peat interspersed as already mentioned. So light and open is this part of the meadow that the water, on being laid on, sinks into the earth immediately, and does not for some hours make its appearance in the ordinary way of irrigation. As the meadows proceed in a descending order, the soil becomes gradually firmer and stronger, consisting in the lowest of a vegetable loam, and earth incumbent on a rather retentive clay. The water that flows over all comes from one source, and frequently the water used on the upper meadow is made use of once or twice on the lower ones.

To questions asked with especial reference to the subject, the attendant on the upper meadows—consisting of a light sandy soil—was most emphatic in giving his opinion, that water, after being much used, became useless for the purposes of irrigation—that, after being once used, it became much deteriorated. The attendant on the lower meadows, on the same questions being put, declared that it did not make any difference—that he observed no difference in the action of the water, whether it came direct from the spring head or subsequent to use by the upper meadows. On being hard pressed, however, he admitted that, if he could always have the choice, he would prefer having the first use of the water, though the difference of fertilising effect was very little.

At the very outset of the inquiry, a great discrepancy of opinion exists; a rigid inquiry will perhaps show that the two opinions perfectly reconcilable. Admitting that flooding land conduces

o a higher degree of temperature, and also that a higher degree of emperature promotes vegetation, by facilitating assimilation, it till becomes necessary to account for the mode in which the food f the grass is to be produced. Now, this may be either brought n to the land by the flowing water, or it may have previously xisted in the soil, and the overflowing water may be merely the neans of rendering the inorganic constituents soluble that preiously existed in the soil in an insoluble form; in either case, vater is the means of promoting fertility. But if the water did not, rom any cause, contain the food of plants, and the soil was equally arren, it is absurd to suppose that flowing water, whether soft or ard, would produce a luxuriant crop. I believe the contradictory pinions previously noticed are reconcilable in the following maner: The upper meadow is a poor arenaceous soil, containing the onstituents of plants in only small quantity; that the soil, being xceedingly porous, rapidly absorbs the stream of water which lows on to it; that this stream contains the food of plants, of vhich the soil, by the absorptive property already noticed, retains part; and then flowing over other meadows containing a larger mount of alumina, probably the whole of its fertilising properties re absorbed; and as the lowest meadow is composed of a good ertile loam, the water, though deprived of its fertilising property, nay only require to be the medium of rendering soluble the nsoluble vegetable food previously existing in the soil. That his is a somewhat correct view of the case, is countenanced by the haracter of the herbage in the different meadows—the uppermost ontaining only light land grasses, such as perennial rye-grass, nnual meadow-grass, and a small quantity of crested dog's-ail. As we descend, the fertile meadow-grass, and in the lowest neadow and strongest land, the *Agrostis stolonifera*, (or fiorin,) escues, meadow-foxtail, and lesser meadow-cat's-tail, form a fair roportion of the herbage—pretty emphatic testimonials of the uperior quality of soil in the lower meadows. It will thus be seen hat the character of the water necessary to produce fertilising ffects may vary on different soils; that which will prove producive on a rich soil might prove unproductive in a poor arenaceous ne. The superior feeding properties of the lower meadows, as ompared with the upper, was perfectly evident; and we suspect, lthough we did not ascertain this point correctly, that the weight f hay produced per acre was heavier on the lower than the upper neadows; or, if not heavier, the hay would be more nutritious, onsisting principally of the foliage of the grasses, whilst the hay rom the upper meadows would be largely composed of the culms f rye-grass. As might be anticipated, "*the plant*" of grass, or ward, was much denser on the lower than the upper meadows. The better to illustrate my views on this subject, let a reverse rder of things be supposed to exist—viz., that the water flowed, in the first instance, over meadows the soil of which is composed

of a mouldy loam, similar to the lower meadows at Killerton, containing a moderate proportion of alumina—in such a case, the whole of the fertilising ingredients of the water may, *a priori*, be fairly presumed to have become absorbed and fixed in the first field, and been deprived of any further fertilising property, other than as a mere solvent. As, however, in this hypothetical case, the lower arenaceous fields would consist of a soil also deficient in the element of fertility, the water, on passing over them, would cease to exercise a fertilising influence. In this way, many apparently irreconcilable statements may be made to agree; and, like many other circumstances connected with agriculture, the discrepancies, or apparent exceptions to general rules and laws, are found to be the consequence of not attending to all the phenomena of the case. In practice, such a case as that just noticed rarely occurs, the light land almost invariably being the uppermost, and, consequently, receives the first benefit from irrigating streams.

The order of things, detailed previously, was given as an illustration of the mode in which water acts on flooded meadows, under different circumstances of soil; and from the varied effects produced, an erroneous conclusion might be come to by the casual observer of the true rationale of the operation.

It is admitted on all hands, that water from uncultivated peat is injurious when allowed to flow over meadows. This might be remedied by putting a little lime in the stream, or letting it pass through a filter of calcareous rubble. Sir J. V. Johnston, Bart., M. P., mentions that a stream on his estate, in the north of Yorkshire, that issued from a limestone rag, was found to produce injurious effects as an irrigant. On being analysed by Professor Way, the only foreign ingredient found was carbonate of lime. The probability is, that, if the soil (the character of which I have not ascertained) was naturally poor in the mineral ingredients of the grasses, whilst the water of irrigation only contained the carbonate of lime, the effect would be, in the first instance, to force forward the grass, which, if mown and carried away, would speedily exhaust the soil. Subsequent barrenness might therefore be anticipated. In the same manner may be accounted the discrepant opinions respecting the propriety of flooding land in summer or winter. At Killerton, the attendant on the upper and arenaceous meadows was very emphatic on the ruinous consequences which followed, laying on the water during summer, while admitting that it was followed by immediate and astonishingly fertilising effects, but that it left the ground utterly exhausted—which baneful effect had been seen for some time. The attendant on the lower meadows was not so emphatic in his denunciation; but he admitted that summer watering had an exhausting tendency, as might well be the case, when it is remembered that the produce was being continually carried off in the form of hay—thus taking away more of the mineral ingredients of the crops than could be absorbed by

the soil from the irrigating water. This view of the case is corroborated by what occurs at the Craigintinny water-meadows, near Edinburgh, where summer flooding is found most profitable; but in this instance the water is loaded with the organic and inorganic fertilising substances arising from the town sewerage of Edinburgh. Summer watering, *per se*, cannot therefore be injurious; it is only so in consequence of the higher temperature increasing the vital energies of plants to the assimilation of a larger portion of their organic and inorganic elements than would be accomplished, during the same period, in the colder seasons of the year—occasional watering greatly aiding their solution, and consequent adaptation for absorption by the spongioles of the roots of the grasses. From these considerations, it may fairly be inferred that, with certain circumstances, such as a strong but well-drained clay soil, (for, if not well drained, the clay will be converted into a bog,) summer watering may be pursued with advantage, as it may also be where town sewerage can be applied. It is not improbable that streams issuing from decomposing porphyritic slates, might be made available for summer watering, as also springs passing through beds of decomposing granite, clay-slates, hornblende, trap, or volcanic tufa or ash, such as that about Killerton, and which is widely diffused in various parts of Cornwall and South Devon, under the name of Dun stone and Honeycombe Dun.

Climate is another element to be taken into account when about to construct water-meadows. It must be very evident that a stream passing through and issuing from a decomposing rock, will be rich in the inorganic elements of plants, or be proportionally attenuated, according to the amount of annual fall of rain. As the average is low, the waters will, *cæteris paribus*, be rich, when the average is high, in the same ratio will the streams be poor, in these essential inorganic elements. Water-meadows formed in the wet and cold district of Argyllshire are therefore less likely to prove remunerative than others constructed in the dry and arenaceous plain of Salisbury; notwithstanding the circumstance that the decomposing primitive slate of Argyll is richer in the inorganic element of plants than the oolitic formation of the Wiltshire Downs.

Before making a general summary, it will be well to make a few observations on a subject which was mentioned at Killerton, and which has received countenance from several published reports —viz. that irrigation has been noticed to visibly change the character of a peaty soil to that of a loam. One of the attendants on the Killerton water-meadows asserted that irrigation washed the peat out—a circumstance so contrary to fact, and to the known insolubility of peat in common water, that an inquiry into this apparent disappearance of peat on irrigated meadows is worthy of a brief notice. The waters at Killerton, as also on many parts of

South Devon, incumbent on sandstone, after long periods of dry weather and frosts, are highly charged with a fine red mud, composed of fine red sand, red oxide of iron, and alumina. The red oxide of iron and the alumina in part form a chemical compound with the peat, and partly become, together with the sand, mechanically intermixed—the whole forming a brown vegetable loam. It is this change of appearance that has caused parties to believe that the peat becomes washed out. Water containing carbonates or sulphates of lime and magnesia, become combined with peat, in like manner forming a fixed chemical compound.

Irrigation by the sewerage of towns could be greatly extended. A fine opportunity now exists for an attempt of this kind on a large scale, in the course of the operations taken by the Commissioners of Sewers for the draining of London. It is intended to raise by machinery the sewerage arising from a district comprising 8000 acres south of London, to such a height that it will fall into the Thames at all periods of the tide sufficiently distant from London that the flowing tide will not again bring the polluted waters within the precincts of the city.

It is surely worth the attempt to raise it a few feet higher, so that it might be distributed over some of the barren heaths of Surrey.

The preceding remarks serve to show that it is not by employing parties guided by *the rule of thumb*, or obtaining the advice of those unscientific *practical* individuals who despise spirit-levels, and judge of the value of a water intended for irrigation by its softness or hardness when placed in the palm of the hand, or even by its vegetative powers in growing good water-cresses, that a comprehensive and at the same time practical system of water-meadows are likely to be planned. To understand the whole of the elements which ought to enter into the calculation, previous to actually carrying out a system of water-meadows, is generally much beyond the education of those who practise the primitive methods just noticed.

A knowledge of the retentive or porous character of the soils to be converted into irrigated lands is one essential; meteorology is a second, as from it must be determined the quantity of water that may probably be obtained at different seasons of the year, and also whether the mineral ingredients of the water will be more or less diffused through a given quantity of water. Geology will often give the observer a tolerably fair estimate of the character of the water intended to be employed; whilst chemistry will give its actual composition and value as a fertiliser. In many instances, no inconsiderable mechanical ingenuity is required to make a small quantity of water serve a wide space of land; on the other hand, equal skill is sometimes needed to devise overflows, and other contrivances, for the purpose of preventing injury being sustained by dammed up torrents, which, if allowed to accumulate,

might cause the sudden rupture of their bounds, and occasion much damage. Having these things in view, it will always be well for parties intending to form water-meadows to call in the assistance of a professional person, to plan and superintend their construction.

The general practice in English irrigation is to lay on the water in October, and let it continue to flow until March, when the water is taken off. This is the practice followed at Killerton, by which means, on the first week of April, the grass is sufficiently grown to be cut—what, at this period, yields as much as would make eight seams per acre, each seam weighing 3 cwt. A second cutting is obtained in June, weighing ten seams, from which period until October the meadows will maintain eight sheep per acre. Mr Turner of Barton states that his sheep never rot on his water-meadows, if the sheep are not allowed to bite close; but if they bite close, they rot. Heavy as the above produce is, it by no means follows that a still greater profit could not be obtained by alternate husbandry. In a dry climate, I believe that water-meadows are more profitable than the alternate system of husbandry; but in wet climates, on loams, free-working soils, and gravels, either silicious or calcareous, I believe the profit preponderates in favour of arable husbandry. With store of swedes, turnips, rape, carrots, cabbage, &c., the farmer has an ample provision against the pinching spring-time; and it ought not to be forgotten that, although the water-meadows produce a considerable amount of spring food, they have been shut up from stock during the whole of the winter season. The stock, therefore, that has to be put on their early herbage must have been kept on something else during the winter—probably turnips. If, however, the farm would produce swedes, it is evident that two or three acres extra of swedes would produce an amount of food equal to a very wide space covered with water-meadows; for it is now well ascertained that swedes can be stored over the entire month of April, and, with care, into the middle of May. On farms formed of soils and placed in a climate favourable to the growth of swedes, the value of irrigated meadows is not so great as on others, where, owing to peculiarity of circumstances, swedes cannot be grown. In mountainous districts, where numerous flocks of sheep and herds of horned cattle are annually reared, catch-water meadows will frequently be found exceedingly advantageous as sources of early spring food, as well as an increased supply of winter forage—matters of great importance in thinly-populated districts, where little arable industry exists; and, in fact, from the nature of the surface, where little can be carried on. The hilly districts under notice usually possess considerable natural facilities for forming catch-water meadows, notwithstanding the adverse accompanying circumstance of a wet climate. Warmth in these cases has, no doubt, a powerful influence.

CEYLON.

(*Continued from page 489.*)

FOR five years after the establishment of the British dominion in Ceylon in 1815, the island continued in a state of constant turmoil. The Kandian chiefs were so rebellious that martial law was declared in the Kandian provinces, and there was no want of pretenders to the throne, among whom was a priest of Buddha, who possessed so much influence, and attracted so many followers, that he long proved rather a formidable enemy to the British—the unwholesome climate of Kandy proving sadly fatal to our soldiery. At length, after much sacrifice of life on both sides, the rebellion was quelled, and its chiefs convicted of high treason and beheaded. From 1820, except a slight conspiracy, which was frustrated without difficulty, there was no attempt at revolt, until that made in 1848, the particulars of which are of course well known to our readers.

The Hon. Frederic North, first Governor of Ceylon, from the time of his arrival in the island in 1798 to his departure in 1805, made the most unwearied exertions for the amelioration of the condition of the inhabitants. He established the first English seminary at Colombo, for the instruction of the ignorant and half-savage natives. He put an end to torture and other barbarous modes of punishment. He abolished the importation of slaves. He found the island a scene of warfare; he left it in a state of comparative tranquillity. These were beginnings, and very important beginnings too, in the work of civilisation. But, notwithstanding of all his exertions, we find that in 1815, when the British obtained full possession of the island, no improvement had as yet been made of its immense natural capabilities. Almost the whole of the interior was covered by dense forests, inhabited only by elephants, cheetahs, and other wild animals. Even the maritime parts, although they had been for centuries under European rule, could scarcely be called more civilised than the interior; and the fortresses, which had arisen all around the island, were constantly disturbed and threatened by a system of perpetual predatory warfare. Roads, it is true, had long intersected all the European settlements; but, in the territories of the native princes, narrow pathways supplied nearly all the means of communication. Thirty-five years have now passed away, during which Ceylon may be said to have sprung into existence; for, although traces were still to be seen of its former high state of civilisation, in the ruins of the magnificent city of Anooradhapoora, the former capital of the island, and other smaller towns, in the vast tanks, and in pieces of sculpture showing considerable advancement in art, civilisation itself had been nearly obliterated.

One vast road now surrounds the whole island, and numerous others traverse the country in every direction. Bridges have been thrown over the rivers, and many facilities given for the transit of merchandise as well as passengers. Besides the numerous schools maintained by the various Church missions, fifty have been established by Government, amongst which the most important is the academy of Colombo. A supreme court was instituted, as well as a legislative council; scientific, literary, and agricultural societies have been formed—the last of which has been of great service to the island—as such societies, when managed with judgment and enterprise, must be to every country, especially to new ones. They for some years published a journal containing accounts of their meetings. They also gave statements of the experience of planters with regard to the latest and best modes of coffee and cocoa-nut cultivation. They encouraged the rearing of all kinds of stock, and the growth of vegetables, by awarding prizes at their annual show, which induced many to introduce a superior breed of cattle from Southern India, as well as to cultivate in the hills a great many of the European vegetables. They built a large shed in Kandy, for the accommodation of the Malabar Coolies on their arrival from India; they laid petitions before Government at different times for the repair of the roads, and suggested many other improvements. They also succeeded in persuading Government to take off the tax which had been exacted from the Coolies when travelling to and from the coast.

It was under the able administration of Sir Edward Barnes, who was governor from 1824 to 1831, that the great road from Colombo to Kandy was planned and completed—a work which is said to have impressed the natives with a higher idea of English ability than all their bloodshed and conquests.*

During the administration of Sir Colin Campbell, who was sent out as governor in 1841, much progress was made in the improvement of the colony generally, and many beneficial changes carried out, which had been projected by Sir Edward Barnes. One act of Sir Colin's, however, has been much canvassed, and threatened, for a time, to deprive him, with a certain party, of that popularity which he had secured to himself by his frank cordial bearing, and his never-failing courtesy. By a Government minute, he prohibited the sale of crown-lands under twenty shillings an acre, which he had found selling at five. Many servants of Government had been purchasing these, and devoting their time to the cultivation of coffee and sugar estates, to the neglect of their official duties. To extinguish this abuse was the resolute determination of Sir Colin Campbell; and this he would

---

* See KNIGHTON'S *History of Ceylon.*

have effected after the same manner as Lord Clive had formerly dealt with a similar abuse in India. Owing to the representations of the governor, the Home Government prohibited all their civil servants from holding land for agricultural purposes. This brought on him a shower of obloquy from those who by these means were, as they thought, in process of amassing large fortunes. But neither censure nor vituperation could move him from his course—he insisted that the civil servants of the Crown should give their undivided attention to their official duties. At the same time, he succeeded in having their salaries increased, in pursuance of a scheme which had been for some time in contemplation—thus in great measure doing away with the temptation to enrich themselves by the acquisition of land. Circumstances, however, prevented the enforcement of this law, for justice demanded that a certain portion of time should be granted them for the disposal of their property. Meanwhile, prices fell so low that an extension of the term could not be denied, and, in the end, this salutary law, if not formally abrogated, became at least a dead letter; for even although the representations made to the Home Government, of the hardship of the case, had not met with a favourable hearing, the unfortunate holders of land would only have been too glad to part with their possessions, even at an immense sacrifice; and new-comers were not likely to need the strong arm of the law to prevent them from embarking in speculations, the unfortunate issue of which met their eyes at every turn, and had been the cause of so much embarrassment not only to Government officers, but to many others who, from injudicious purchases, want of personal superintendence, and the intrusting the care of their estates to persons who proved unworthy of their confidence, had been many of them almost, and not a few altogether, ruined.

The great reduction of duties in 1846 could not fail, at such a time, to have its influence in filling up the measure of alarm and depression which had already spread itself over the whole island, and many estates which had been formed with much cost and labour were parted with at one sixth of their estimated value, and were purchased by those wary speculators who are always ready to avail themselves of such opportunities, and who, by entering on their properties at an enormous advantage, are not likely to be seriously affected either by legislative changes or by the usual fluctuations of trade. Into the causes of these fluctuations, the over-trading and consequent gluts in the markets, so distressing to emigrants to our colonies, especially to Australia, it is not our present purpose to enter; but the subject of emigration itself, so interesting to agriculturists, having lately been discussed in connection with Ceylon, we cannot pass it over here without directing the attention of our readers to the arguments that have been brought forward in favour of the scheme, and also warning them

against being led away by a too favourable picture of its offered advantages. A circular issued by Mr Baker, one of two brothers who have been settled for some years as agriculturists at Newera Ellia, presents a complete scheme of emigration from this country thither, and sets forth, in a somewhat too sanguine manner, what he considers to be its prospects of success.

Newera Ellia, the *sanatorium* of the island of Ceylon, was first established in 1828, by that wise and enterprising governor Sir Edward Barnes, who caused storehouses and military quarters to be erected there. The place had been visited nine years before by Dr Davy, who at once perceived, and also fully explained, the great advantages that might be derived from its temperate and healthful atmosphere as a military convalescent station, and the result has entirely justified his expectations. A great saving has been effected to Government, and Newera Ellia is now regarded as the Simla of Ceylon. When the station was established in 1828, there were no vestiges of former occupation, save only a few ruined buildings, and the remains of an ancient temple. It is situated about six thousand feet above the level of the sea, and is described as a plain or high table-land—which is not strictly correct, as it is divided unequally by an entire chain of hills. There is a plentiful supply of water; and during the rainy season the noise of the waterfalls, from the vast volume of the torrents incessantly rushing down from the hills above, is heard from the distance of miles. There is limestone also in abundance, at about two thousand feet below the station; and it is said to have been in pursuit of game, which abounds in this district of country, that a party of our officers, under the guidance of natives, first discovered these fine plains. The highest mountain in Ceylon, Pedro-talla-galla, is the crowning point in the bold and picturesque scenery around, its sharp peak rising more than eight thousand feet above the level of the ocean. The thermometer rarely rises higher than 65° of Fahr., and occasionally falls as low as 28°. Snow has never been known to fall, but ice about half an inch thick frequently forms during the night. In winter, the air has been compared to a fine English October; and in summer, as may be supposed, there is none of that sense of oppression which would remind the dwellers that they are not only living within the tropics, but only seven degrees from the equator. A church has been erected, as well as houses for the governor, the bishop, the colonial secretary, and other Government officials; and a detachment of troops is always stationed there. The road to the station was a work of great labour, and many difficulties were encountered in its formation, especially the latter part of it, which is not only steep, but also intersects a mountain-pass, from the sides of which large masses of soil and stones are continually rolling and blocking up the path—causing constant labour to keep it in repair. The mountains around are covered with fine wood, and

many residences have arisen on their beautiful slopes, as well as on the plain below—all white-washed and cheerful looking, presenting the addition of chimneys, so strange in the East, and so strongly reminding of home; for fires morning and evening are not only agreeable, but absolutely necessary.

This, then, is the place to which Mr Baker would now direct the attention of his countrymen, as presenting a new field for the enterprising agriculturist, propounding a system of emigration on a great scale, and offering peculiar advantages to the new colonist. He expatiates on the difficulties and discouragements that settlers almost invariably meet with in proceeding to Australia or America, "landing in a wild and barren country, houseless and friendless, with nothing but the certainty of the greatest privations before them;" and suggests a system by which comfortable farms, dwelling-houses, and all the requisite buildings, would be ready for the immediate occupation of the settler on landing. The soil resembles that of Great Britain, varying from the rich brown to the black loam; and that it is highly favourable to the growth of our home crops is proved by the circumstance that many of the natives, in whose hands all the farming has hitherto been, have amassed considerable sums by the cultivation of potatoes, turnips, and other European vegetables. Green crops of all kinds have thriven, and proved highly productive; and wheat, barley, oats, beans, and pease have been tried successfully, though not as yet very extensively. When it shall have been fully established that all these European crops can be raised as well or better than in England, as the promoters of emigration confidently maintain, the saving to the colony will indeed be immense—many of these necessaries of life being, up to this time, imported into the island at an enormous expense. Of potatoes alone, Mr Baker says, when adducing proofs of the fine quality of the soil, that the natives, even with their crude method of farming, have been able to produce five successive crops from the same land. Ceylon receives all its supplies of flour from America and Bombay, and yet, when the experiment of raising wheat in the island has been made, it has been found quite superior to the seed imported. For all heavy work, the draught buffalo has entirely superseded the horse, not only because of his greater strength, but the saving in food, as he requires nothing else than pasture. Mr Baker admits that, although the price of stock is very low, good meat is almost unknown in the island, the animals being sold unfattened, and generally slaughtered without discrimination. Were attention steadily directed to the fattening and improving of the breeds, there can be little doubt that the result would be remunerative to the farmer, though probably not to the extent that Mr Baker anticipates.

A friend who visited Newera Ellia in June last writes to us that it strongly reminded him of home, as there were numbers of

discharged soldiers and such people settled there, each of whom had his little cottage, and patch of ground planted with potatoes, cabbage, &c.—vegetation all around wearing a familiar aspect, presenting almost all the fruits and vegetables produced and consumed by ourselves, including apple, pear, and peach trees; also in flowers, the damask and pink rose-trees, violets, sweet pease, and rhododendrons. He mentions also Mr Baker and his brother as having purchased a tract of land, which they were engaged in farming regularly as in England, adding that they were said already to have laid out L.7000 upon it, and yet to have done very little. This may be an exaggeration; but even allowing that a far smaller sum may have been expended, and much yet remaining to be done, we feel justified in warning small capitalists to pause before they allow themselves to be led away by glowing pictures of any land, however fair and seemly. There is scarcely any case in which the work of emigration and settling in a new colony is not one of difficulty, privation, and many discouragements utterly impossible to foresee; and although it would be useless to deny that, whether entered on with high or moderate expectations, circumstances may occur, and changes may arise in the colony itself, even between the emigrant's leaving home and arriving at the place of his destination, which may either dash his hopes at the outset, or throw a fortune into his empty lap—for such are the strange chances that run through and rule all things in what is called the lottery of life—still no one is justified in not making use of every means of inquiry within his power, before entering on changes in which, even after every inquiry, many risks are involved.

Mr Baker dwells much on the freedom from the many taxes which are so heavy a burden on industry at home; but the expense of living, on the other hand, must go far to balance this advantage. The difficulty of procuring regular labour also has always been a great grievance in Ceylon, entire crops having frequently been sacrificed for want of hands; and this is an evil which no amount of foresight can avert, for the Coolies often take flight in large bodies, leaving the unfortunate proprietors in the very midst of reaping. Or when the case is not so bad, and labour only scarce, it is not uncommon to see an estate of three or four hundred acres in full bearing, with only twenty or thirty Coolies on it. These Coolies come from the Malabar coast, and their periodical visits are prompted by their necessities alone. These are so small—their principal food consisting of rice, and three-halfpence a-day being sufficient for their support—that they are soon enabled, by earning a small sum, to return to their families—which they do suddenly, and without notice, and renew their visits only when this sum is expended. The Cingalese also, who would seem by all accounts to be as lazy as the Irish and the Highlanders,

are as determined not to work so long as they have a morsel to eat; and as this can be procured with scarcely any exertion, their assistance cannot be taken into account at all in the matter of labour. To obviate this difficulty, Mr Baker proposes that farm-servants should be sent out from this country; and he has himself engaged a considerable number of both sexes with the view of employing them in farm labour on his property. He has also, in pursuance of his scheme, supplied himself with all sorts of farming implements from England—thus showing his own sincere desire to exemplify, and fully carry out, the system he so earnestly recommends to others. Settlers in this temperate region would be thus rendered entirely independent of Coolie labour; for the British farm-servant can work at all hours of the day; and it being part of the scheme, that they should be accompanied by their families, there is, therefore, no risk of their taking flight after the manner of the Coolies. The first expense, however, of taking out farm-servants from England—many of them with wives and families—must be very great, and calls for the serious attention of intending emigrants.

In 1843, Mr Bennet, in his valuable work on Ceylon, expresses his astonishment that, among the many schemes for emigration that have attracted the attention of the British public, none of the speculative individuals who had been so prominent in such plans of public utility had ever thought of suggesting the formation of a company of moderate capitalists for establishing themselves in Ceylon; and, although the climate generally is adverse to European labourers, he says there are "numerous places of great extent," where they might be advantageously located. But with the view of preventing the chance of their being misled, either by hearsay or by the glowing accounts of doubtful publications, he proposes as a preliminary measure that a deputation of competent individuals should proceed to Ceylon, at the expense of the Company, for the investigation of the climate and capabilities of the island, on the understanding that no ulterior measures were to be entered into but on the official report of the committee. Such is the scheme, put into shape, and entering fully into details, which Mr Baker now proposes should be carried out; but no steps, as far as we have been able to learn, have as yet been taken towards its fulfilment. Mr Bennet, however, is much less sanguine in his anticipations, and administers more in the way of warning, than Mr Baker, using a degree of caution, when treating of so important a subject, which we feel it impossible to attribute altogether to the different times at which they wrote, or to any development which may have taken place in the capabilities of the island. Bennet denounces as "criminal and delusive" the holding out of even the slightest prospect of success to any other than *possessors of moderate capital;* and if what we have heard of

Mr Baker's outlay be anything like correct, we should say that rather an immoderate capital was needed to insure the success of the settler. Mr Sirr also, in his recent work, and from the most recent experience and observation, in commenting on Mr Baker's scheme, when giving him full credit for integrity, and the laudable nature of his enterprise, makes use of the most cautious language, and warns every one not to look for fortunes and luxuries, but only for "some comfort and an honest livelihood." We repeat that we have no desire whatever to discourage emigration, but think, on the contrary, that, were it entered into on a large scale, it would be a great blessing to this country, and that Mr Baker's scheme is highly deserving of attention, and himself of thanks, for the trouble he has taken in bringing it before the public. We only maintain that all such schemes should be thoroughly sifted, and the evidence on both sides weighed, before putting capital, however moderate, to the hazard.

Before leaving the subject of emigration, it is of importance our readers should be made aware that there is one class of workmen much needed in Ceylon, and who would be sure to better their condition. These are skilled artisans, such as carpenters, smiths, and mill-wrights—but especially the last. They would be sure to earn more than double the wages they receive in this country—the more skilful among them, we believe we do not overstate the thing when we say much more than double. Then they have the advantage of being able to work in-doors, an advantage which is denied to the labourer, and which renders emigration out of the question for persons of that class, except to such temperate regions as that of Newera Ellia.

We have lately been told that Mr Baker is now directing his attention to dairy produce and the breeding of stock, more than to the raising of European crops; and that, whether from mismanagement on his part, or from the indifferent character of the English labourers taken out by him, many of them have left his property and sought employment elsewhere. Excepting at the small island of Delft, near Jaffna, cheese has never been made in Ceylon, and what is imported is sold at the enormous rate of 2s. a pound. Butter sells for 2s. 6d. a pound, and sometimes even rises as high as 4s. Hams and bacon have never been cured to any extent, in spite of the plentiful supply and moderate price of pigs, and are generally sold as high as 2s. a pound. Should Mr Baker, therefore, succeed in producing those articles at Newera Ellia equal to the English, it is quite evident the prices would be remunerative to the farmer. With regard to the successive crops of potatoes—which are ready to dig, Mr Baker says, three months after the planting of the sets, and one of which has often been known to yield fifty potatoes—we cannot see how these can be produced without manure, of which he makes no mention. But probably, having grass-

land on his farm, he left this to be implied. The potatoes grown at Newera Ellia are of a superior quality, and sold, when Mr Baker's circular was written, at 28s. a cwt.; but they have since been offered in the Colombo market at 20s., and even as low as 18s.; and it must not be forgotten that the consumption is entirely confined to the European population, the natives being content with their own yams, which may be had almost for the lifting. Poultry, both there and throughout the island, is plentiful and cheap, fowls being sold at 6s. and 7s. a dozen—ducks, &c., in proportion. But here, as well as with other stock, the price of fattening must always be taken into account, which materially adds to the first cost. Of animal food, the best to be had is pork, and quite moderate in price; beef, though cheap, is tough and lean; and mutton, when to be had in the markets, has hitherto been so exorbitant in price, being sold as high as 2s. a pound, that residents have been in the habit of clubbing together for the purchase and feeding of sheep—which did not, however, reduce the expense to anything like a moderate rate. Now, however, excellent sheep, which are brought from Southern India, may be had for 7s.; and if fed for a month or two on pasture, with now and then a handful of grain—which is extremely fattening—the mutton is as fine as any that can be had in this country, and quite moderate in price when cut up and divided among three or four neighbours. When mutton was so high in price, the flesh of young kids came into constant use as a substitute, and was found to be such delicious eating that it is not unlikely it will still keep its place as a staple article of food, especially as it only costs 6d. or 7d. a pound. It cannot be denied that, on the whole, the expense of living in Ceylon is very considerable, partly from masters being at the mercy of the appoo, or head-servant, who goes to the store to purchase whatever may be needed for daily consumption, and on whose honesty there is no check, prices being regulated by supply and demand; and also from the usual grievance of the East—the enormous profits charged on all imports; which grievance would be greatly modified, if not done away with, were Mr Baker's scheme, of the success of which we are not over-sanguine, to be entered into on anything like an extensive scale.

Although the number of domestic servants kept by each establishment is not so great as in India, or the wages so high, still the expense is a heavy one compared with that of a moderate household in Europe; and the duties, after all, are not so well performed as they are in England, by two or three women servants. In the jungle, and especially in remote districts, wages are much higher than in the towns, the appoo, or head-servant, receiving 30s. a month; and even this is a great reduction, for a few years ago £2 were quite common. The cook is always paid at the same rate. Servants performing the same offices in India only receive 20s.

The horse-keeper in the jungle has from 20s. to 22s. 6d.; and there is a horse-keeper, as well as a grass-cutter, for each horse—the latter receiving about 4s. 6d. Then there is a water-carrier, a house-servant, and a table-servant—the last two being paid at the rate of 15s. to the latter, and 10s. to the former.

Bachelors, when economically disposed, can do with three, and even sometimes with two servants; but we speak of establishments where there are ladies and children, and where, besides those already enumerated, there is a native female attendant, who receives about 15s. a month. There are no assessed taxes, and house-rent is comparatively moderate; but at Kandy, where everything is dearer than in Colombo, rents are in some parts higher than in England; and at Newera Ellia, where every article of food is exorbitantly dear, and houses sometimes not to be had at all, rents are as high as at a fashionable watering-place in England in the height of the season.*

Another proposition which has been under discussion for years, and which is of the utmost importance to Ceylon, both in an agricultural and a general point of view, is the restoration of the tanks; and this, we are glad to say, has not only met with full consideration, but will, we hope, soon be in process of completion. Among the advantages possessed by Ceylon, over many other countries, is a most plentiful supply both of river and spring water, and these chiefly of the purest description. That the ancient inhabitants of the island knew well how to make use of the best means for securing a constant and plentiful supply of water, and that they were fully alive to the benefit of irrigation, is proved by the immense tanks and lakes constructed by them, the ruins of which indicate a highly populous country, and point to a bygone time of almost incredible civilisation and prosperity. Cingalese historians affirm that there were at one time more than 200,000 artificial tanks in Ceylon, one of which, called the Giant's tank, is said by them to be the work of the giants; and seventeen others, together with a canal, by means of which 20,000 paddy-fields were formed, and dedicated to one of their temples, they declare to have been the work of one of their kings in the year 275, while the ancient capital of Anooradhapoora was yet in all its glory. Such is the manner in which these historians deal with hundreds of thousands, in an island the circumference of which is scarcely 900 miles! The most ancient of these tanks are Kandelle and Minere, in the eastern province, and Cattockare, or the Giant's tank, near Mantotte, in the northern. Kandelle is fifteen miles in circumference, and its embankment rests at one extremity on solid rock, and on an artificial mound of earth at the other. Minere is twenty miles in circumference, surrounded by marshy

---

* See SIRR's *Ceylon and the Cingalese.*

lands, where rice might be very extensively cultivated. Cattockare lies in a large tract of very low land, and of its immense extent some idea may be formed by the fact of whole villages having been reared *within the tank*, the inhabitants of which have irrigated their paddy-fields by constructing smaller tanks for this purpose. As far back as the beginning of this century, the restoration of this immense tank was under consideration; and the colonial engineer of the period gave in a report on the subject, in which he estimated the expense at £25,000, and reckoned that the work of restoration would occupy three years. But if it be true what the natives affirm, that the tank would be sufficiently supplied by the water of the rivulets which flow into Cattockare, without the aid of the river, the cost would be much smaller than that laid down in the engineer's estimate; and, of course, a much shorter time would be occupied in the work.

In the immediate vicinity of the Giant's tank there is a wide tract of country lying unproductive, which is capable of being converted into paddy-fields, if the means of artificial irrigation were at hand; and it has been estimated that, by the repair of this tank alone, land capable of producing 150,000 bags of rice annually would be laid under irrigation. The subject of the renewal of the tanks has been under the consideration of many successive Governors—amongst others, of Sir Robert Brownrigg, Sir Robert Horton, and Mr Stewart M'Kenzie, all of whom agreed in the opinion that it should be a Government undertaking; and those who were appointed to examine into its details, concurred in the conclusion that the expenditure incurred would be repayed, and more than repayed, by the increased revenue. To render Ceylon independent of other countries for rice, the staple food of such an immense number of its population can only be secured by such a system of irrigation as would be obtained by the restoration of the tanks. The rice consumed is great part of it imported; but it has been reckoned that sufficient might be grown, not only for home consumption, but also large quantities exported. It has been proposed that the Hindoos, who are a very superior race to the Cingalese, and much more industrious in their habits, should be induced to settle in Ceylon, and receive grants of land for a certain number of years, paying a rate on those deriving benefit from the repaired tanks, the extension of their term being made proportionate to the increase of agriculture, by which means Government might secure the cultivation of the greater part of the country by Hindoo settlers. The sanguine, speculative nature of the Hindoos, which is shown wherever they receive corresponding encouragement, has been urged in favour of the plan; and also the beneficial results of offering liberal conditions of settlement, which would follow both to Government and the colony generally. But it is plain enough that if the tanks were restored,

or even seen to be in process of restoration, no great amount of persuasion would be necessary to induce settlers, whether Hindoo or others, to avail themselves of such an obvious advantage. Government reports had been made on this matter from time to time, but still no steps were taken till the late Colonial Secretary, Sir J. Emerson Tennent, collected these, and revived the scheme; and an act has now been passed for the making and repairing of roads, and including the restoration of the tanks; and it is this act about which such a storm was raised, and so much said as to the renewal of compulsory labour—the ignorant natives concluding that it was nothing else than the renewal of the Raja-Karia, which had been abolished in 1832.

By the old law of Raja-Karia, the natives had been reduced to the condition of serfs, and were required to give labour of an unlimited kind. They might be taken from their harvest, and sent to the most remote parts of the island; they were compelled to work for Government at every description of labour; their chiefs and headmen were to be exempt, and it was by them they were to be driven. These headmen too often abused that power, over which it was so difficult to exercise a check; they frequently called out for labour more than double the men required, and exacted bribes for the privilege of exemption. By the new law their labour was limited to six days, and it was not to be required till after their harvest; they were to work only in the construction of roads, and the repairing of tanks, and that in their own neighbourhood, and for the improvement of their lands and villages; and they were to elect their own district committees for the regulation of the labour. Every male in the island, from eighteen to fifty-five years of age, except the Governor, (the Buddhist priests also, after much discussion, were exempted,) was included in this ordinance, and was to give either six days' work or pay three shillings. This enactment has been regarded with much suspicion in many quarters. Colonel Forbes, amongst others, considers it as a covert manner of introducing new taxation, and otherwise burdening the poor natives, and asks, "If it is competent to the legislature of Ceylon to cause every man to serve for a week, why may they not increase it to ten?" But this and other acts of the late Government have been under consideration of a committee of the House of Commons, and have, we trust, been candidly and dispassionately judged of. For our own part, we feel strongly inclined to pronounce in favour of the ordinance, for aught yet seen, and cannot perceive how it differs, in any essential particular, from our own Statute Labour. If there be penalties and punishments attached to its infringement, these are not greater than are absolutely needed; for every one who has been in the East, or who has any experience of Eastern affairs, can bear testimony to the impossibility of keeping the native population in

subjection without such penalties; and that, if we owe our dominion in great measure to the confidence the natives have always placed in British integrity, we owe it quite as much to the enforcement of a rigid system of discipline, which has never been relaxed without producing evil and threatening consequences. All the great roads, and many other improvements in Ceylon, have been made under compulsory labour; and it is difficult to see how they could be otherwise effected. Much has been done, and many roads made; but still there are districts from which the produce is with great difficulty conveyed, either to the towns nearest them, or to the sea-ports for exportation—not absolutely for want of roads for their transit, but from the extreme badness of these—from which cause much deterioration takes place of coffee and other produce, owing to delay, damp, and rain. The bandy, or native cart, often gets imbedded in the mud up to the axle-tree, and the drivers are obliged to unload and lay their burden on the road-side, till they drag the bandy out of the slough, during which operation torrents of rain are probably falling. It must be confessed, however, that is no easy matter to keep roads in order during the south-west monsoon. The present ordinance proposes to meet this evil, and we cannot but wish it all success, seeing it is of such high importance to the agriculturist, and especially as it includes the restoration of the tanks—a measure which has been proposed for nearly half a century, and yet been allowed to slumber on, in spite of the recommendation of nearly every writer on the history, aspect, and capabilities of the island, the representations of governors, and the reports of engineers, as well as its own advantages, we should have thought evident to all.

The soils of Ceylon are quite in a natural state, and only contain between one and three per cent of vegetable substance, which has been attributed to the rapid decomposition caused by a high degree of temperature and heavy rains. Quartz is the largest, and often almost the sole ingredient in the soils, which seem to have originated from decomposed granite rock, clay stone, or gneiss. The dark-brown loam is formed from gneiss and decomposed granite; and the reddish loam is formed from the clay stone, or the cabooc stone; and it is from these soils that the most abundant crops are produced. It is in those which contain the largest proportion of quartz that inferior crops are found to be produced. The productive quality of the reddish-brown loam has been attributed to its property of retaining moisture for a very long time.

The natives have hitherto conducted their agriculture on the very simplest principles, the cultivation being confined by them to two descriptions alone—those of the wet and the dry. The dry system is only adopted by the poorest classes, who cultivate on their Chenas—or grounds overgrown with underwood—Indian corn

and a coarse species of rice. They begin by cutting down the jungle, fencing in the part intended for cultivation, and consuming the wood which has not been needed for that purpose; they then turn up the ground and sow it. No further trouble is taken, except occasional weeding, until the time of harvest. In these grounds crops do not grow a second year, because the underwood, which has never been fully extirpated, soon springs up again into a plentiful crop. This species of cultivation, however, is very inconsiderable compared with the wet, which is pursued by the natives in every locality in the island where a sufficiently plentiful supply of water can be commanded for the culture of the paddy in all its successive stages. The cultivation of this species of grain is carried up the sides of the hills in the form of terraces, as it is in China; and the appearance of the grain itself is not unlike that of wheat. It is frequently to be seen in adjoining fields in all its various stages, from that which is but newly sown to the reaping and treading out by buffaloes. The great advantage which would be gained by the colony, were the tanks and lakes to be removed, is apparent from this circumstance alone, that two or three crops may be grown annually in the same field where the farmer has a sufficient supply of water at command; but only one when he is dependent on the rainy season alone. In the hilly districts, there is a mode usually adopted of making an elevation in the centre of the paddy-field, round which is extended a terrace lower in height, and so on—each one descending as it approaches the bottom of the artificial mound. All the level spaces are kept constantly supplied with water, and are separated from the terraces underneath by mud walls, in which perforations are made to allow the water to irrigate the lower terraces. In the flat country, embankments are raised all around the paddy-fields, which are flooded with water nearly three inches deep; and after being saturated, they are ploughed while still under water, and the ground is trodden out by buffaloes until it is fairly worked into mud. The water is then drawn off, and the paddy seed thrown over the muddy surface; whenever it has taken root, the openings in the embankments out of which the water had been drawn off are again closed, and the field reflooded. When the paddy has risen to the height of about three inches, it is carefully weeded; but the field is kept under water till the paddy is nearly ripe, and when reaped is at once taken to the thrashing-floor, and trodden out on a hard floor made to suit the purpose by beating the clay.

Before the treading work is begun, however, a mystic rite is performed by the owner of the paddy, and an incantation made, with the view of preserving the grain from the influence of evil spirits. Three circles, one within the other, are described by the owner on the centre of the floor, by scattering the ashes of wood from a large leaf; and each of the circles is equally quartered by

a cross. He then lays some paddy straw within the inmost circle, and places a few pieces of quartz and a piece of Kohomba-tree thereon, and covers the whole over with paddy straw; he then walks three times round the mystic figure, and stopping at one of the ends, salaams three times with uplifted hands, and finally lies for a time prostrate on the earth repeating incantations. His rising is the signal that the ceremony is ended, and the work then begins of treading out the corn.*

There are no less than eleven kinds of paddy (rice in the husk) cultivated in the low grounds, some of them requiring four months to come to maturity, and these are generally sown in March; others three months, and they are sown in June. One kind must remain in the ground as long as five months; while another, reared in very low grounds, comes to maturity in two. The growth depends so entirely upon irrigation, that the seasons for sowing, which vary according to the district and kinds to be sown, must be chosen when the streams are full, or when a sufficient supply of moisture during the period of growth is insured by a continuance of rain, either in the locality itself or in the heights where the streams rise. The lands used for this lowland cultivation can be sown from season to season; but the hill paddy, of which there are also many kinds, will only grow on a soil which has for many years been undisturbed; and partly from its being so exhausting a crop, partly from the poorness of the land, each crop requires newly cleared land, and is never sown oftener than once a-year. Any deficiency of requisite moisture produces a total failure of the crops, and no artificial manure is ever made use of, the natural soil being assisted only by the ashes of the wood fires. It has been reckoned that, in the cultivation of hill paddy, the labour of two men will produce sufficient for the maintenance of three persons; whereas in the low grounds the labour of one man will support three, and often more.

Paddy land is the only land in Ceylon subject to taxation, and this is levied in a twofold manner—by a tax on all lands cultivated with rice and fine grain; and an import duty of 7d. a bushel on rice imported from the Indian coast, and 3d. on paddy. This high tax on the import was fixed by Sir Edward Barnes with a view to the encouragement of native cultivation, the growth of rice having diminished year by year; but the hoped-for effect did not follow, and Sir Edward does not seem to have ascribed its failure to what seems to us the great cause—the ruined state of the tanks, and the consequent want of sufficient means of irrigation. The assessment—which on some lands amounts to one-fourth or one-fifth of the produce, and on others to only one-tenth or one-fourteenth—is levied, according to returns made by Government assessors, who

* For a detailed account of this and other such ceremonies, as well as of the culture and appearance of the paddy-fields, see SIRR's *Ceylon and the Cingalese.*

calculate the probable value of the crop with reference to soil, time of harvest, and appearance of the grain. This gives rise, as may be supposed, to many devices for deceiving the headmen and the Government servants, who, in their turn, have recourse to all sorts of extortion and vexatious interference. It has been proposed by Sir J. Emerson Tennent to abolish this tax, and substitute one on land of 2s. 9d. an acre; but this has met with some opposition, and is still under consideration.

The plough used in Ceylon is of the most simple nature, and is in most instances held by one man only, who guides the oxen or buffaloes with a goad, urging them on occasionally with his voice. Mr Sirr thus describes it—"The share and single upright handle are made out of a curved piece of timber; the single handle is surmounted with a cross-tree; a pole is fastened into a mortice with a wedge, at the curve between the handle and share, while a yoke is attached by coir cords to a pair of buffaloes or oxen." A large hoe of the most unwieldy description, but which is used by the natives in the most skilful manner, is often employed by them as a substitute for the plough. After ploughing the ground they do not make use of a harrow, but of a board with a pole, to which buffaloes or oxen are yoked, with the driver sitting upon them. When preparing the land for paddy seed, a strange sort of implement, somewhat like a rake without teeth, is used. The implements used in the jungle, the hook, axe, &c., are not at all unlike those used by ourselves for forest work. Knox, in the middle of the seventeenth century, bears testimony to the expertness of the Cingalese in reaping. He says—"At reaping they are excellent good, just after the English manner." But, after minutely describing the Oriental custom of treading out the grain from the husk, he designates it "as a far quicker and easier way than thrashing," —a conclusion, we suspect, which must have been disputed in his own time almost as much as in ours.

Of the native productions of Ceylon, the most remarkable, and one we believe to be found nowhere else, is the lemon-grass, or the *Andropogon schœnanthus*, which may be seen covering almost all the Kandian hills, and is the best possible pasture for cattle—at least as long as it is young. This species of grass is very hard, and grows to the height of seven feet, and sometimes higher, and has a strong but extremely pleasant acid taste. It derives its name from having, when crushed, an odour like that of the lemon, so strong that after a time it becomes quite heavy and sickening, although grateful and refreshing at first. It covers the hills in patches—those, at least, that are not overgrown with jungle and underwood—and is to be found nowhere but in the Kandian district. Spontaneous ignition frequently takes place, and the appearance of the burning grass is described as most magnificent, forming one of the great attractions for travellers from Kandy to Newera Ellia,

many of whom stop at Gampola, a few miles from Kandy, in the near neighbourhood of which rises the mountain of Ambulawe, on whose slopes, in the wet season, the grand spectacle of the conflagration is to be seen. Flames burst forth from spot to spot till they unite and become a mighty conflagration, which goes on rapidly against the wind, the long grass bending by the force of the wind towards the flames. When the conflagration is at its height it throws a wild lurid light around, and a growling hollow sound is heard at an immense distance. When it has by degrees subsided, volumes of dense smoke roll upwards, sending forth millions of sparks, which, falling on whatever grass may be remaining, frequently cause a second conflagration to arise. A few days after, from the midst of this parched and blackened, and apparently dead ground, lovely young green shoots begin to arise—for the roots of this extraordinary grass have not even been injured, far less destroyed, by the fire; and in a very short time the whole brow of the mountain is again overspread with tufts of beautiful green waving grass.

There is much else that is curious in the vegetable world of Ceylon, on which we may still hereafter slightly touch. In our next Number we propose giving an account of the culture of coffee, cinnamon, the cocoa nut, &c., closing here for the present.

LEGISLATIVE MEASURES OF THE SESSION OF 1850, RELATIVE TO AGRICULTURAL AFFAIRS AND RURAL IMPROVEMENT.

(*Concluded from p.* 541.)

LOCAL TURNPIKE ACTS.

Glasgow and Shotts Road Improvement Act.—This act (cap. 13) was passed "for improving the Glasgow and Shotts Turnpike Roads." The preamble clause, after reciting the titles of three previously existing statutes, viz.—the Glasgow and Shotts Road Act, 1847; the 2d of William IV. for amending the laws concerning Turnpike Roads in Scotland; and the Lands Clauses Consolidation (Scotland) Act, 1845; proceeds to state, that "it would be attended with public advantage and convenience, if the trustees appointed by the first-recited act were authorised to improve a portion of the turnpike road under their management, leading from Glasgow towards Edinburgh, in and near the village of Camlachie, by altering the levels and width of the said road, and making a new piece of road, and also to improve and alter the levels of another portion of the said road in the parish of Bothwell." To effect these objects is the design of the present act. Accordingly, in the third clause we find that plans and sections descriptive of the lines and levels of the proposed improvements, &c., together with books of reference to the same, containing the names of the owners, lessees, and occupiers of the lands through which

the improvements are intended to be made, have been deposited in the offices of the sheriff-clerk at Glasgow and Hamilton, there to remain for public inspection and perusal; one shilling to be paid for the perusal, and sixpence for every one hundred words of copies or extracts. The works to be executed are thus specified in the fourth clause:—

And be it enacted, that it shall be lawful for the said trustees to improve the turnpike road under their management, leading from Glasgow towards Edinburgh, by Camlachie, Parkhead, and Shotts Hirst, by altering the levels and width of the said existing road, and making a new piece of road between East John Street, in the burgh of Glasgow, and the east boundary of the Eastern Cemetery, in the Barony parish of Glasgow; and also to improve another portion of the said turnpike road, and alter the levels thereof, between the bridge over the Wishaw and Coltness Railway at the Holytown station, and the avenue leading to the Mansion-house of Woodhall in the parish of Bothwell, in the lines and through the lands delineated on the said plans and described in the said books of reference, and according to the levels defined on the said sections, together with such footpaths, bridges, embankments, retaining walls, ditches, drains, fences, and other necessary works upon or near thereto as may be thought requisite, and for the purposes aforesaid to enter upon and take possession of the said lands, subject always to the conditions and restrictions contained in the said Lands Clauses Consolidation Act.

The next clause empowers the trustees to deviate from the plans and sections to any extent not exceeding five feet, (provided such deviation shall not extend into any lands not described in the books of reference,) without the written consent of the person through whose lands such deviation shall be proposed to be made, unless the name of such person shall have been omitted by mistake. All lands authorised to be purchased by the trustees are to be paid for within three years from the passing of this act; failing which, the powers contained in this and the Lands Clauses Consolidation Act are to be void, unless with the consent of the owners and occupiers of such lands respectively. The portions of road authorised to be made are to form part of the Glasgow and Shotts turnpike roads. The expense of obtaining this act, and all other expenses incident thereto, are to be defrayed by the trustees "out of the tolls authorised to be levied by the said first-recited act and this act." In citing this act in legal instruments, it will be sufficient to use the expression, "The Glasgow and Shotts Road Improvement Act, 1850."

Cromford and Newhaven Turnpike Road Continuation Act.—In the 6th of Geo. IV., an act was passed to amend the road from the market-place in Cromford to the guide-post on Hopton Moor, and two branch roads to Newhaven House and Wirksworth, all in Derbyshire. Under this act, it appears, divers sums of money were borrowed on the credit of the tolls, amounting in the aggregate to £4181, which, together with a large amount of interest thereon, are still owing. The intent of the act passed last session is to continue the former act for a further period, and to amend the same; and accordingly enacts that the act of Geo. IV. shall continue for the term of twenty-one years from the passing of this act, or until the said debt of £4181 shall be fully paid off, which-

ever shall first happen; existing arrears of interest on the debt to be extinguished from the passing of this act—viz. July 29, 1850. All monies received by the trustees, from and after the 1st of January 1851, to be applied as follows:—Firstly, in discharging the expenses of obtaining this act, and the salaries of the surveyor and other officers; Secondly, as to one-sixth of such monies, to the improving and keeping in repair the said roads, according to a rateable proportion per mile; Thirdly, in paying the interest upon the debt of £4181, at the rate of 3 per cent per annum; Fourthly, as to the residue of such monies, to the reducing and paying off the said debt. When a surplus sum of £200 shall accumulate, the trustees are empowered to apply the same, as far as it will go, in payment of such sum as shall be agreed to be accepted by any creditor as the smallest composition in satisfaction of his share; public notice of such intended application to be made twenty-one days previous to the 31st of December in each year. By the 8th clause, the trustees are prohibited from borrowing any further sum of money in addition to the monies which they have already borrowed. From and after the 1st of January 1851, no greater toll than eightpence to be demanded "for every horse or other beast drawing any waggon, cart, wain, or other suchlike carriage, upon two or more wheels, the fellies of which are of less breadth than 4½ inches." The next clause releases the trustees from the obligation, imposed by a former act, to maintain the Pike Hall road, leading from Nottingham to Newhaven, (by reason of the greatly altered state of the traffic, &c.,) or to pay the wonted sum of £60 a-year to the trustees of the Nottingham and Newhaven road; the trustees under this act to be precluded from henceforth receiving any tolls in respect of the said Pike Hall road. In citing this act in legal instruments, it will be sufficieut to use the expression, "The Cromford and Newhaven Turnpike Road Continuation Act, 1850."*

REGISTRATION OF LANDS IN IRELAND.

An act (cap. 72) was passed last session "to amend the laws for the registration of assurances of lands in Ireland." The laws which this act is intended to amend, had their origin in certain statutes passed in the Irish parliament in the reigns of Anne, Geo. I., II., III., and subsequently in the imperial parliament, in those of William IV. and Victoria, relative to the public registering of deeds, conveyances, and wills that should be made, of any

* The remaining Turnpike Road Acts, amended and continued last session, consisting of the Garstang and Heiring Syke Turnpike Road Act, Rochdale and Bury Turnpike Road Act, Heronsyke and Eamont Bridge Turnpike Road Act, Ulverstone, Millthorpe, and Lancaster Turnpike Road Act, Tewkesbury Severn Bridge and Roads Extension Act, Birmingham and Pershore Turnpike Continuation Act, Croydon and Reigate Turnpike Road Act, and the Merionethshire Turnpike Roads Act, are so very similar in import, that reference to them by name is here considered a sufficient notice of their respective claims.—EDITOR.

honours, manors, lands, tenements, and hereditaments; and by the act of William IV., an alphabetical index of the names of persons affected by memorials, to be called the "Index of Names," was required to be made and kept in a manner specified in that act. In the preamble to the act of last session, it is stated to be expedient, for the more convenient registering of instruments affecting lands in Ireland, that, in future, indexes should be formed with reference to the general survey of Ireland made under the direction of the Board of Ordnance. The 2d clause thus indicates the form in which the Indexes are to be kept.

And be it enacted, that it shall be lawful for the commissioners of her Majesty's Treasury to authorise and direct to be made for each county and city being a county of itself, and for each town which it may seem to the said commissioners expedient to index apart from the county in which it is situate, a land index, in such form as they shall approve, so as to show in every such index appropriated to a county, the baronies, townlands, denominations, and sub-denominations, and other divisions of land within such county; and in each index appropriated to a city or town, the parishes and streets, denominations, and divisions of land within such city or town, having references in every such index from the several townlands, denominations, sub-denominations, streets, and divisions, to the maps to be used for the purposes of this act; and it shall be lawful for the said commissioners to cause to be inserted in such respective land indexes, or to give directions for the insertion therein, from time to time, of the names or short descriptions of the manors and incorporeal hereditaments which cannot be conveniently indexed with reference to maps within the respective baronies, parishes, and other divisions of land in every such county, city, and town respectively; and every such land index shall be deposited in the said Register Office, and shall be a land index to be used for the purposes of this act.

When the maps and land indexes to be used are completed, three months' notice to be given in the *Dublin Gazette* of the commencement of registration. No memorial of any assurance executed after the commencement of registration, by which any lands may be affected at law or in equity, to be registered; but all such assurances may be registered by depositing an original, and making the proper entries. In addition to the land indexes, an index to be called "The Index of Titles" is to be kept for all Ireland. By the 7th clause it is enacted, that decrees in equity creating, declaring, transferring, foreclosing, or determining interests in land; and also decrees in equity by which any such decree shall be varied or reversed; and orders of exchange, partition, or division and allotment made by the Incumbered Estates Commissioners, are to be considered assurances; and every civil bill decree is also to be deemed an assurance affecting the lands of which the possession is thereby decreed. Every private act of parliament passed after the commencement of registration, by which any lands in Ireland are affected, is to be considered an assurance. Affidavit of ownership made under the 13th and 14th of Victoria (cap. 29) also to be an assurance. In cases where, by a public act, any lands are vested upon the payment of money, &c., a memorandum of the payment or other act may be registered; but not to extend to the vesting of the estate of a bankrupt or insolvent. Equitable mortgage by deposit of deeds, may be registered by depositing a

memorandum; and also liens by reason of nonpayment of purchase-money, with such particulars by the vendor as are sufficient to identify the same, and containing likewise a description of the lands, and expressing the amount of the money for which a lien is claimed. Where lands have not been registered, power is given to any person claiming under assurance to compel the registration thereof by application to a judge. Assurances authorised to be registered, and not having been so, to be void as against purchasers under any subsequent assurance duly registered. Persons interested under uses or trusts affecting any estate or interest in lands in Ireland, vested under a registered assurance, may enter an inhibition against alienation. Protection by legal estate and tacking, not to be allowed, except as against any estate or interest which may have existed prior to the commencement of registration. An assurance which would have the effect of merging any interest, not to have such effect as against a subsequent purchaser of such interest, unless an entry be made to lead such purchaser to the assurance. Searches of the indexes to be permitted, and inspections of deposited documents allowed. Transfers and other assurances relating to shares in public companies or private works, not to be affected by reason of non-registration under the provisions of this act. The Treasury to fix the amount of fees to be taken under this act.—[There are also two other objects contemplated by this act, not necessary to be detailed in this place: these refer to the providing of an "Index to Wills and Administrations," and an "Index to Bankrupts and Insolvents;" both which are also to be kept in the Register Office.]

MARKETS AND FAIRS.

Sunday Fairs and Markets.—In the 27th of Henry VI. (1448) an act was passed relative to "certain days whereon fairs and markets ought not to be kept," and wherein it was provided that all fairs and markets on certain principal feasts therein mentioned, including also "Sundays" and "Good Friday," should cease, "the four Sundays in harvest excepted." The purport of the short act passed last session (cap. 23) is to "repeal" such exception, the original act to be construed as if the exception had not been inserted therein.

Wakefield Borough Market (Amendment) Act.—This act (cap. 8) furnishes additional powers to the Wakefield Borough Market Company, in conjunction with the provisions of an act passed in 1847. In the preamble clause of the present act, the Company are authorised to take "certain other lands" for constructing thereon a market-place, and to make certain roads, streets, or approaches to the same, and to alter and enlarge a certain road called Vicarage Lane; also a street leading from Northgate to Goody Bower, and a road or passage called Goody Bower. The 2d clause repeals so much of the former act as authorised the company to purchase by

compulsion the lands and buildings described in schedule A of that act, such repeal, however, not to divest the company of any lands actually purchased by them, nor to affect contracts for the purchase of lands (if any) which may have been entered into prior to the passing of this act. The next clause notifies that a plan showing the lands upon which it is proposed by the company to construct a market-place, and other buildings, together with a book of reference to such plan, containing the names of the owners and lessees, and of the occupiers of such lands, has been deposited with the clerk of the peace of the West Riding of the county. The 4th and two subsequent clauses empower the Company to make roads, streets, or approaches between certain places in the borough of Wakefield, (the particular localities being indicated,) such approaches and alterations to be made conformable to the deposited plan; power, however, is given to deviate, to a certain extent, from the line, site, or levels defined on the said plan. The 9th clause protects the Company against being compelled to purchase any property which shall be wholly situate beyond the limits of deviation described. The proposed market-place to be completed with five years after the passing of this act, (17th May 1850.) The 13th clause refers to the rights pertaining to the governors of the Free Grammar School at Wakefield, and is as follows:—

And be it enacted, that nothing in this act contained shall be construed to prevent the governors of the Free Grammar School of Queen Elizabeth, at Wakefield, who are also trustees of other public charities and institutions there, from using, letting, or occupying any of their lands for the sale of cattle weekly, as heretofore; and the said Borough Market Company shall not use any of their lands as a market for the sale of horned cattle, sheep, and pigs, except on Fridays, and the Thursday before either Good Friday or Christmas Day, (when Christmas Day shall fall on a Friday,) and except also at the two great fairs, so long as the said governors and trustees shall continue to provide sufficient accommodation for that purpose: provided always, that so long as proper accommodation shall be provided, either by the said governors and trustees, or by the said Company, no horned cattle, sheep, or pigs shall be exposed for sale in the open streets.

In citing this act in legal instruments, it will suffice to describe it as "The Wakefield Borough Market (Amendment) Act, 1850."

Reading Cattle Market Act.—This (cap. 42) is entitled "An act for providing, regulating, and maintaining a Cattle Market in the borough of Reading, in the county of Berks, and for constructing a convenient Market Place therein." The preamble clause commences by a reference to the charter of incorporation, granted in the 2d of Elizabeth, by which the mayor and burgesses of the borough of Reading, and their successors, were privileged for ever to hold a market on every Saturday, and also four marts or fairs to be holden annually in a place called the Forbury, within the limits of the said borough; such fairs to be successively kept on the feasts of St Philip and St James, St James, St Matthew, and the Purification of the Virgin Mary, and "on the eve and morrow of the same feasts," together with a Court of Piepowder to the said market and fairs. The clause then proceeds to state, that the

places where the cattle market is held are unfit for the wants of the borough of Reading, and that it would be of great benefit to the said borough and neighbourhood if a market place for the sale of cattle and live stock, horses, sheep, lambs, and pigs, were provided within the borough, and the same in future to be held on *Tuesday* (instead of Saturday) in every week, subject to proper regulations for the conduct and management of the same. With a view to the effectually carrying out of these objects, it is enacted by this act that certain individuals, (named in the 6th clause,) "and all other persons and corporations who have already subscribed, or shall hereafter subscribe, to the undertaking," shall be united into a company, by the name of "The Reading Cattle Market Company" and as a body corporate shall have power to purchase and hold lands conformably to the provisions of this act. The capital of the said Company, in the first instance, to be £3000, which may be further increased to £5000, by the issue of new shares at the discretion of the directors. The number of shares into which the original plan is to be divided are to be limited to six hundred, and that of the increased capital to four hundred; the amount of each share to be £5. The amount of any call not to exceed £2 per share, and two months to intervene between any two successive calls. The Company are further empowered to borrow, from time to time, on mortgage of the rates, stallages, rents, and tolls, any sums of money they may deem necessary—conditionally, however, that the sums so borrowed and owing at any one time shall not exceed in the whole one-third of the subscribed capital of the Company; nor is any money to be borrowed until the whole of the capital of £3000 shall have been subscribed for, and one-half thereof paid up. The number of directors of the Company to be limited to twelve, with power to reduce the same to not less than nine. Three directors to form a quorum, and a like number to go out annually by rotation. The first ordinary meeting of the Company to be held within six months after the passing of this act, (July 15, 1850.) The 18th clause refers to the construction of the new market place, "with all necessary buildings and works, approaches and conveniences thereto, for the exposure and sale of cattle and live stock usually sold in cattle markets." The property selected for the site of the proposed market place is thus described in a schedule appended to the act:—"A piece of meadow land 3 acres, 2 roods, 16 poles, called the Cricket Ground; a shed and garden, 33 poles; a piece of meadow land, 2 acres, 1 rood, 16 poles, adjoining the Cricket Ground; a small piece of void land, and the Pound." The next clause enacts, that after the opening of the new market place, any person (except an auctioneer selling in any place other than the public streets) who shall expose for sale, except on his own premises, any cattle, horses, sheep, &c., subject to the tolls authorised by this act, to be liable to a penalty of forty shillings. By the

21st clause it is enacted, that the day on which the cattle market shall be held shall be *Tuesday* in each week, or such other day as the company shall fix under the "Markets and Fairs Clauses Act, 1847;" provided that such new day be subject to the approval of the court of Quarter Sessions; the hour for opening the market to be not later than nine in the forenoon, and for closing not later than three in the afternoon. The next clause enacts, that if at any time the said new market place shall be found not sufficiently capacious, the Company are empowered to enlarge the same from time to time as occasion may require. The 23d clause refers to an arrangement entered into between the Corporation of the Borough of Reading and the Cattle Market Company, by which the latter are to pay to the former the sum of £5 annually by way of royalty, or compensation for the rents, tolls, &c., arising from the present cattle market, the same to be paid on the 25th of December every year for ever; and if not paid within seven days after any of the annual days of payment, the goods and chattels of the Company may be distrained upon. The next clause empowers the mayor of the borough for the time being (as the clerk of the market) to hold any fairs or marts in the new cattle market, on paying a compensation to the Company for the use of the same, and for any damage which may be occasioned thereby. Lands to be appropriated by the Company for extraordinary purposes not to exceed three acres. The 26th clause refers to the tolls to be taken, which are thus specified in a second schedule:—

For every covered and uncovered shed, stall, bulk, standing-place, or station, used for exposing to sale any cattle or live stock, tolls not exceeding the following, per day or part of a day, as the case may be: for every superficial yard, 6d. For the exposure to sale of horses, cattle, or live stock, as follows: that is to say, for every horse, mare, or gelding, colt or filly, 6d.; mule or ass, 3d.; bull, ox, cow, heifer, or steer, 6d.; calf, 3d.; score of sheep, lambs, or pigs, 1s. 8d. And so in proportion for any greater or smaller number of sheep or lambs; one or more, not exceeding ten, to be paid for as a half of a score. And for any greater or smaller number of pigs, one or more, not exceeding five, to be paid for as a quarter of a score.

The Company are empowered to lease standings in the market for any term not exceeding three years; lessees restrained from assigning lease of standings without the consent of the Company. All the clauses and provisions of the following acts (except where expressly varied) are to be incorporated with, and form part of, this act; namely, "The Companies Clauses Consolidation Act, 1845," "The Lands Clauses Consolidation Act, 1845," and "The Markets and Fairs Clauses Act, 1847." Nothing contained in this act to exempt the Company from the provisions of the "Public Health Act, 1848." In citing this act in legal instruments, it will be sufficient to use the expression, "Reading Cattle Market Act, 1850."

The Cambridge Corporation Act.—This act (cap. 37) was passed with a two-fold object; first, for regulating the markets and fairs held within the borough of Cambridge, and at Reach in the same

county, and for enlarging the market-place;" and secondly, for rebuilding the Guildhall, and effecting other municipal improvements in the said borough. Our analysis will be confined to the former purposes of this act, as more immediately applicable to these pages. The corporation of the borough are the authorised undertakers for carrying this act into execution, and are empowered to borrow money for that purpose, on mortgage or bond, not exceeding £40,000, to be secured on the credit of the borough fund: 1 per cent on all monies borrowed to be set apart as a sinking fund for paying off the same. The lands to be taken or appropriated by the Corporation for extraordinary purposes, not to exceed twenty acres. The whole of the houses in Warwick Street, Cambridge, are intended to be purchased for the purpose of applying the site of the same to the enlarging and rendering more commodious the existing market-place. By the 25th clause, the Corporation are empowered to provide slaughter-houses; and from the passing of this act, (July 15, 1850,) all existing tolls in the markets and fairs are abolished, and a new rate substituted. The tolls, stalls, &c. may be leased for any term not exceeding three years. The duration of Midsummer Fair is thus defined in the 32d clause:—

And for removing doubts as to the legal period of holding the fair of Barnwell, commonly called Midsummer Fair, be it declared and enacted, that that fair shall commence on the 22d day of June (or if that day be *Sunday*, on the *Monday* next following) at twelve of the clock at noon, or at such earlier hour as the same shall be proclaimed by the mayor, and shall continue for the three days (exclusive of Sunday) next following the day of the commencement thereof, and no longer.

The next clause enacts that all booths and shows in every fair shall be closed before twelve o'clock at night on any Saturday during which such fair shall continue, and on such other days as the mayor shall, by public notice, direct; and no such booth or show shall be opened on any Sunday, or on any day except during the continuance of the fair. The legal limits and bounds of Reach fair are defined to be "all places situate within half-a-mile of the site of the ancient chapel in Reach." The provisions of "The Markets and Fairs Clauses Act, 1847," with respect to the selling or exposing for sale any unwholesome meat, &c., to extend to all places within the limits of this act, as well as to the markets and fairs. A penalty of forty shillings for the first offence, and £5 for the second or any following offence, is imposed on persons "using any dog or goat for the purpose of drawing any cart, carriage, truck, or barrow." Two schedules appended to the act describe the respective localities of the borough in which certain house property and land will be required for the foregoing purposes; these are—Union Street, Market Hill, Saint Mary's Street, Warwick Street, and Saint Mary's Passage. A third schedule specifies *in extenso* the stallages, rents, and tolls henceforth to be taken in the Corn Exchange, in the markets, and at the fairs. In citing this act in legal instruments, it will be sufficient to use the expression "The Cambridge Corporation Act, 1850."

THE FARMERS' NOTE-BOOK, No. XXXI.

Composition of House Coal Soot.—By Dr Augustus Voelcker, Professor of Chemistry in the Royal Agricultural College, Cirencester.—Soot has latterly been strongly recommended as a useful addition to the manure-heap, or as a top-dressing for potatoes, oats, wheat, and artificial grasses; and its effects on vegetation are indeed so well known to all who have tried it, that they willingly pay as much as 4d. or 5d. per bushel for it.

Though we possess several partial analyses, no complete one has as yet been undertaken of soot by any chemist. To supply this want I engaged in the examination of it, and have chosen the soot that is to be purchased in preference to samples, which I might readily have collected myself. Commercial soot, as bought soot may be termed, is never collected so carefully, and generally contains more mineral matters; and the quantity of ammonia in it appears to vary according to the height of the chimney from which it is taken—consequently the analyses of a small portion can never afford so fair an idea of its average composition, as that of a sample taken from a large quantity, such as is actually to be found in the market.

1. *Water.*—The amount of mixture in house coal soot was found to be 10.620 per cent.

2. *Mineral matters.*—When burned, the sample examined left a reddish ash, amounting to 42.926 per cent in soot in the natural state, or 48.027 per cent when dried at 212°. This large quantity of ash results partly from coal ash, which had been carried up by the draught, and partly from accidental impurities, such as the mortar of the chimney, sand, &c.

As a variable quantity of ash in soot is obtained from different varieties of coal, it is likely to contain a smaller or larger proportion of mineral substances. Professor Johnston, to whom we owe a partial analysis of soot, has shown this to be the case. He found that soot of the

Durham	caking-coal,	No. 1, gave a red ash,	= 29½	per cent	of the soot.
Do.	do.	No. 2, gave a red ash,	= 25¾	do.	do.
Edinburgh	splint,	from laboratory, gave a white ash,	= 48½	do.	do.
Do.	do.	from private house, gave a reddish ash	= 18	do.	do.

The weight of a bushel of soot varies greatly, which perhaps is chiefly to be ascribed to the larger or smaller proportion of mineral matters contained in it.

On examining the chemical nature of the ash left on burning soot in an open platinum crucible, I found it to consist of the following substances:—Oxide of iron, alumina, lime, magnesia, potash, soda, silica, sand and clayey matters, sulphuric and phosphoric acids.

The sulphuric acid appears to be all combined with lime in gypsum. Gypsum is present in the ash in large quantities, and may be readily extracted from it by boiling-water; on evaporating

the liquid to a small bulk, the gypsum separates in minute but distinct hard white crystals. The ash contained no chlorine. Having found, however, that a watery solution, tested with nitrate of silver, while observing the necessary precautions which have to be attended to, gave me distinct indications of the presence of chlorine, this element must have been driven off by the heat at which the carbon of the soot was burned away. Like all kinds of soot, this sample contained considerable quantities of ammonia, partly in combination with chlorine, partly with that of sulphuric acid. When sulphate of ammonia is heated with chloride of sodium or chloride of potassium, we obtain by double decomposition the sulphates of soda or potash, which remain behind, and the chloride of ammonium, or sal ammoniac, is expelled by the heat. In soot, we find, as I shall presently show by the results of an analysis made by my assistant, Mr Williams, under my direction, chloride of ammonium, or sal ammoniac, chlorides of potassium and sodium, and sulphate of ammonia; but neither the chlorine of the sal ammoniac, nor that of the fixed alkaline chlorides, can be detected in the ash of soot, because all the chlorine had been expelled in combination with ammonia, by the burning. Sal ammoniac partly exists ready formed in soot, and partly it results from the decomposition of chloride of potassium and sodium, which takes place at the high temperature at which the soot-ash is obtained. The watery solution of soot is coloured deep brown by organic substances, which render the determination of chlorine in the usual way inapplicable. In order to secure an accurate estimation of the quantity of chlorine, I caused a portion of soot to be burned with a quantity of chemically pure carbonate of soda, sufficiently large to retain all the chlorine.

3. *Organic matters.*—Soot boiled with water and filtered, furnishes a deep reddish-brown coloured solution, which, besides soluble inorganic salts, salts of ammonia, and empyreumatic matters, contains several organic acids, similar to those which may be obtained by boiling peat-mould with water.

When soot is treated with a dilute solution of carbonate of soda, after having been washed until the water passes through the filter quite colourless, which takes a very long time in doing, the solution again assumes a deep reddish-brown colour. Muriatic acid, added to this solution until it becomes slightly acid, throws down a copious brown precipitate, which consists of several organic acids. Amongst these humic and ulmic acid are found, two substances which are present in smaller or larger quantities in all fertile soils.

Thus treated, the organic part of soot, consisting chiefly of finely divided black carbon, still contains a mixture of organic compounds, known under the names of insoluble humus or coally humus. Caustic potash renders these substances soluble; and by boiling soot which first has been washed with water, and subsequently with carbonate of soda, with a solution of caustic potash, again a

deep brown coloured liquid is obtained, from which a flaky brown precipitate is thrown down by adding muriatic acid in a slight excess.

The presence of ammoniacal salts in soot is readily discovered by a strong smell of ammonia, when it is moistened with water and mixed with a little quicklime.

In the following Tables the composition of house coal soot is exhibited—in the first columns in its natural state; in the second, dried at 212 deg.; whilst the third ones show how much of each ingredient one ton of soot contains.

ANALYSES OF HOUSE COAL SOOT.

Sample taken from the farm buildings of the Royal Agricultural College at Cirencester.

	Natural state. Per cent.	Dry state. Per cent.	Natural state. Per ton. lb.	oz.
Moisture,	10.620	...	237	14
Organic matters and ammoniacal salts, containing 1.22 of ammonia,	46.454	51.973	1040	9
Oxides of iron and alumina,	15.691	17.555	351	7½
Lime,	7.840	8.771	175	9¾
Magnesia,	.389	.435	8	11¼
Potash,	.318	.355	7	1¾
Soda,	.122	.136	2	11¾
Sulphuric acid,	8.670	9.700	194	8¼
Phosphoric acid,	.259	.289	5	12¾
Carbonic acid,	.497	.556	11	2
Chlorine,	1.008	1.127	22	9¼
Soluble silica,	4.014	4.490	89	14¼
Insoluble silicious matter (chiefly sand)	4.159	4.653	93	2½
	100.041	100.040	2240	13¼

Arranged in chemical compounds, the composition of soot may be represented as follows:—

	Natural state. Per cent.	Dry state. Per cent.	Natural state. Per ton. lb.	oz.
Moisture,	10.620	...	237	14
Organic matter,	44.736	50.051	1002	1½
Chloride of ammonium, (sal ammoniac,)	.933	1.043	20	14¼
Sulphate of ammonia,	3.580	4.005	80	8
Chloride of sodium, (common salt,)	.231	.258	5	2¾
Chloride of potassium,	.503	.562	11	4¼
Oxides of iron and alumina,	15.691	17.555	351	7½
Sulphate of lime, (gypsum,)	11.051	12.364	247	9¼
Phosphate of lime, (bone-earth,)	.530	.593	11	13¾
Carbonate of lime,	1.129	1.263	25	4¾
Lime, (in a state of silicate,)	2.290	2.562	51	4¾
Magnesia, (in a state of silicate,)	.389	.435	8	11¼
Soluble silica, (combined with lime and magnesia,)	4.014	4.490	89	14½
Insoluble silicious matter, (chiefly sand,)	4.159	4.653	93	2½
	99.856	99.834	2286	11

These analytical results suggest a few remarks, to which we may be allowed briefly to allude.

1. *Organic matters.*—The organic substances in the soil play an important part in the processes of the nutrition of plants. Though the efficacy of humus in soils has been doubted or explained away according to preconceived theories, and even been denied altogether by some writers on agricultural chemistry, in spite of all practical experience, more recent researches have established the fact beyond doubt, that humus supplies plants with food — whether with organic alone, or inorganic likewise, or whether it exercises merely a beneficial influence on vegetation, in furnishing a continual source of carbonic acid, arising from its decomposition, or whether it acts beneficially in condensing ammonia-gas from the atmosphere, we will not here discuss. Humus certainly performs a most important part in the soil, and acts beneficially on vegetation in more ways than one; for which reason every attempt to explain its functions by *one* action only must be unsatisfactory, and might lead the practical husbandman to serious errors in the management of his land.

In the organic part of soot many substances identical or analogous to those occurring in humus, are found in considerable quantities, and it is, therefore, more than likely that the fertilising effects of soot are partly due to the organic matters it contains. The finely divided charcoal, which constitutes the greater part of these organic matters, may also not be without its use in promoting a healthy growth of plants, as it is well known that charcoal powder exceeds all other substances in the remarkable power of absorbing and condensing in its pores the ammonia from the atmosphere.

2. *Salts of ammonia.*—Both sal ammoniac and sulphate of ammonia, two salts which are found to exist in soot, have been extensively employed as a manure. The results of comparative experiments with salts of ammonia, made by Mr Main, Mr Fleming of Barrochan, Mr Melvin, Ratho, Mr M'Lintock, and others, and published in the Transactions of the Highland and Agricultural Society, prove that ammoniacal salts applied as a top-dressing to wheat, oats, turnips, and grass-land, considerably increase their produce. According to the above analysis, 1 ton of soot contains nearly 21 lb. of sal ammoniac, and 80 lb. of sulphate of ammonia; and as the price paid for salts of ammonia is high, its money-value, as well as its fertilising one, depends in a great measure on the proportion of ammonia which it is capable of yielding.

The proportion of ammonia varies; according to our analysis, from about 1 to 5 per cent of the whole weight of soot; and in the particular sample analysed, it was found, as stated above, to amount to 1.22 per cent.

Three years ago I made some determinations of the quantity of

ammonia in soot for Professor Johnston, the results of which are recorded in his "Contributions to Scientific Agriculture," and in the Proceedings of the Agricultural Chemistry Association. In looking over these results, I find that an error has crept in, which I beg to correct. In page 196 of the "Contributions" it is stated that "the quantity contained in four varieties, above mentioned, were carefully determined by my assistant, Dr Voelcker, and found to amount to.

Edinburgh laboratory soot,	=	1.76	per cent.
Ditto house soot, .	=	1.81	„
Durham house soot, No. 1,	=	0.92	„
Ditto, No. 2,	=	4.94	„

These are equal to—

Edinburgh laboratory	=	10½	per cent of crystalised sulphate of ammonia.	
Ditto house,	=	10⅘	„	„
Durham house, No. 1,	=	5½	„	„
Ditto, No. 2,	=	29½	„	„

The quantities of crystallised sulphate of ammonia here mentioned are stated too high; for, on recalculating the results from the above ammonia determinations, I find that the ammonia in

Edinburgh laboratory soot,	=	6.82	per cent of crystallised sulphate of ammonia only.	
Ditto house, .	=	7.01	„	„
Durham house, No. 1,	=	3.54	„	„
Ditto, No. 2,	=	19.14	„	„

3. *Potash and soda.*—These two important alkalies were contained in soot in the form of chlorides. Though the quantity of potash in 1 ton of soot amounts to only 7 lb., yet even this quantity cannot be without its effect on vegetation. The presence of potash and soda in soot is likewise interesting in a scientific point of view, inasmuch as it points out indirectly the vegetable origin of coal. Professors W. B. and R. E. Rodgers, to whom we are indebted for a series of elaborate experiments on the decomposition of minerals and rocks by pure water, and water containing carbonic acid, distinctly have shown the presence of potash and soda in anthracite, coal, &c.; and they have thus removed the doubt of the vegetable origin of coal, which the absence of alkalies in coal might create. These gentlemen found that, when coal or anthracite was washed on a filter with distilled water, the washings always contained traces of alkali, which they were unable to detect in the ash of the same coal or anthracite. The absence of alkalies in the ash of coal, therefore, does not prove the absence of potash and soda in coal itself; for Messrs Rodgers explain their absence by the high temperature required to produce the ashes, and which appears to be so intense as to volatilise the alkalies.

I have repeated the experiments of Messrs Rodgers, and had no difficulty in finding potash and soda in the watery liquid, which I obtained by washing in a filter finely powdered coal with distilled water. If the alkalies are really volatilised at the temperature at which coal-ashes are produced, potash and soda, I inferred, must

be contained in the soot; and actual experiments have proved my anticipation to be correct.

4. *Gypsum. Bone-earth.*—The proportion of gypsum in soot, as seen from the above analyses, amounts to no less than 247 lb. per ton; whilst the quantity of bone-earth amounts to nearly 12 lb. per ton. Both gypsum and bone-earth, more particularly the latter, belong to our more important fertilisers; so there can be little doubt that the effects of soot are due, to some extent, to the presence of the phosphate and sulphate of lime.

5. *Soluble Silica and silicates.*—On grass-land and on carse, the effects of soot are so strikingly exhibited, that its ammoniacal salts must be reckoned amongst the chief causes of its fertilising effects; but they are not the only constituents which determine its economical value. Soluble silica, or silica in a state of an easily decomposable silicate, is applied with benefit to land on which oats and wheat have a tendency to become weak in the straw. In soot soluble silica exists, in all probability, in a free state, as well as in the form of silicates of lime and magnesia, and is perhaps on this account beneficially applied to wheat or oats as a top-dressing.

6. *Conclusion.*—Soot contains many of the elements necessary for supplying the wants of growing plants; for which reason, its fertilising effects must be attributed, not merely to one or the other of its constituents, but rather to the complex nature of its composition.

*Cross-breeding.**—No part of physiology is so obscure as that which treats of the general principles regulating the productions of breeds and varieties. Almost all that is known upon the subject is, that the properties and peculiarities of the parent are usually transmitted to the offspring. In practice, parents possessing peculiarities that are considered "good points" are selected, and the general result of this has unquestionably been to greatly improve the breeds of our domesticated animals. All breeders, however, will acknowledge that they have frequently been disappointed much beyond their expectation, and that an increased knowledge of facts and general principles upon this subject is much to be desired. Of late, some speculations have been put forward regarding it, by Mr Walker. These have, we believe, been adopted by an eminent agricultural authority. For our part, however, we regard these opinions of Mr Walker as visionary and unfounded.

The pamphlet of Dr Harvey's, at the foot of this page, is an account [illegible] remarkable effect of cross-breeding, which he has been attending to and investigating for some two or three years past. He has published [illegible] papers respecting it in various periodicals. Here [illegible] densed [illegible] the facts that he has

* [illegible] Remarkable effect of Cross-Breeding, by Alexander Harvey, M.D., lecturer on practice of medicine in the University and King's College, Aberdeen, &c. [illegible] W. Blackwood & Sons.

gathered, and the conclusions that he thinks may be prudently come to regarding it. He thus states his subject:—

There is a circumstance connected with the process of breeding in the higher classes of animals, which seems to me to merit a larger share than it has yet received of the attention of the agricultural body. It is this,—that a male animal that has once had fruitful connection with a female, may so influence her future offspring begotten by *other* males, as to a greater or less extent to *engraft* upon them his *own distinctive features*—his influence thus reaching to the subsequent progeny, in whose conception he himself has had no share, and his image and superscription being, so to speak, more or less highly inscribed upon them.

Dr Harvey proceeds to observe, that if this be true, it is obviously capable of great practical application in the breeding of stock. If it be a fact—or at any rate, if it be a fact of common or frequent occurrence—it is plain, that the greatest possible care should be taken in the selection of the male, and particularly of the first male, in the coupling of animals. It will also give a clue to the real explanation of many of the disappointments the practical breeder has so frequently had to complain of. Dr Harvey has evidently bestowed great pains in collecting evidence upon this subject. We will notice some of his examples:—

It was long ago stated by Haller, that when a mare had had a foal by an ass, and afterwards another by a horse, the offspring of the second begotten by the horse, nevertheless, approached in character to a mule. About thirty-five years ago, a chestnut mare, the property of the Earl of Morton, was covered by a quagga, "a sort of wild ass," says Dr Harvey, "and marked somewhat after the manner of a zebra." In due time she produced a hybrid, which showed unequivocal marks of his origin in the shape of its head, stripes upon its shoulders, and so forth. Afterwards, and in three different years, the mare was covered by a black Arabian horse, last time she produced a foal, but every foal was marked after the quagga. This is a very decided case. Dr Harvey produces another analogous one. Sir Gore Ousely had a mare that was covered by a zebra, and produced in due time a striped hybrid. The two subsequent years she was covered by a horse, a different animal being employed the second year from the first. But, upon both occasions, the foals to which she give birth were striped.

Our author next proceeds to give instances of females covered by males of the same species, and where the characters of the male by whom the female first conceived, were distinctly visible in future offspring begotten by other males. We regard the careful evidence Dr Harvey has gathered upon this point as very satisfactory. We extract some original and conclusive facts with regard to sheeep:—

Not the least striking examples, perhaps, of the phenomena, are the two following observed in the sheep; the first communicated to me, by my friend Dr W. Wells of the island of Grenada, the other by Mr William N. Combie, Tillyfour, Aberdeenshire.

a. A small flock of ewes belonging to Dr Wells were tupped a few years ago, by a ram procured for that purpose from the manager of a neighbouring estate. The

ewes were all of them *white* and *woolly*. The ram was of quite another breed, being, besides having other marks of difference, of a chocolate colour, and hairy, like a goat. The progeny were of course crosses, bearing, however, a great resemblance to the male parent.

The next season, Dr Wells procured another ram of precisely the same breed as the ewes. The progeny of this second connection showed distinct marks of resemblance to the former ram in *colour* and *covering*. And the like phenomena occurring under the like circumstances, was observed in the lambs of some other adjoining estates in Grenada, and was the occasion of equal surprise and perplexity to the owners of the animals.

b. Six very superior pure bred *black*-faced *horned* ewes, the property of Mr Harry Shaw, in the parish of Leochel and Cushnie, in Aberdeenshire, were tupped in the autumn of 1844, some of them by a Leicester, *i. e.* a *white*-faced and *polled* ram; others of them by a Southdown, *i. e.* a *dun*-faced and *polled* ram. The lambs thus begotten were crosses.

In the summer of 1846, the same ewes were tupped by a very fine pure black-faced horned ram, *i. e.* one of exactly the same breed as the ewes themselves. To Mr Shaw's astonishment, the lambs were all without exception *polled*, and brownish in the face, instead of being black-faced and horned.

In autumn 1846, the ewes were again served with another very superior ram of their own breed. Again the lambs were mongrels. They did not indeed exhibit so much of the character of the Leicester and Southdown breeds as did the lambs of the previous year, but two of them were *polled*, and one *dun*-faced, with *very small* horns, while the other three were *white*-faced, with very *small round horns only*. Mr Shaw at length parted with these fine ewes, without obtaining from them one pure-bred lamb.—p. 6, 7.

Dr Harvey then proceeds to inquire whether any analogous facts are in being relative to the human species. Upon this head we must refer to the pamphlet.

He goes on to consider an explanation of all these curious occurrences first offered by Mr Gillavray, V.S., of Huntley, but improved and expanded by Dr Harvey. Their explanation may be thus stated. In the mammalia, the young offspring are lodged in the womb for some time before their birth and complete existence as separate animals. Between the mother and the fœtus, a connection is established by means of the placenta, which constantly receives supplies of blood from the parent, and constantly parts with the same to the child. It is possible, (but by no means certain,) that a continued interchange is going on in this placenta, between the blood of the fœtus and mother, and that not only does blood belonging to the latter enter into the circulation of the former, but that the blood of the fœtus, is, although in small degree, passing into the circulation of the mother. As the blood of the fœtus may be reasonably supposed to have inherent in it the constitutional qualities of the fœtus, it may, if it mix with the mother's blood, impart these qualities to the mother's blood, and therefore to the mother's constitution. But these qualities of the fœtus must be supposed to be in part derived from the male parent. Therefore, in this manner, may the properties of the male parent be communicated to the system of the female parent. As this communication between the mother and fœtus is usually kept up for a long period, several weeks or even months, it is urged, that this theory of the manner in which subsequent offspring to another male, unquestionably often resemble the first male by whom the mother became pregnant.

From the time we read Dr Harvey's first paper, we doubted altogether the correctness of this explanation; and we notice that Dr Harvey, although far from giving it up, is not quite so clear of its truth as he then was. We then thought, as we still think, that the resemblance of the subsequent offspring to the first male by whom the mother was impregnated, was to be explained upon the principle of *mental influence*, and not upon *inoculation* of the mother's blood, by the matter of the blood of the first fœtus that she bore. Many facts, we thought, bore out this view of the case. Some of these are very clearly stated by Dr Harvey. We select the following:—

A mare and a horse, (a gelding,) had for some years worked together on the same farm, occupied adjacent stalls in the same stable, and pastured together in summer in the same fields. The gelding was of a *black* colour, with *white* legs and face, and had a *singular peculiarity* in the form of the hind legs, which, when the animal was standing, appeared as if quite straight, there being no appearance of the leg being bent at the hough joint, as in ordinary cases; the pasterns likewise were very long, so as to cause the feet to look as if placed almost at right angles to the legs. After having been some years thus associated with this gelding, the mare was covered by a stallion of exactly the same colour as herself—both stallion and mare being of a *bay* colour, with *black* legs and a *small spot* of white only on the forehead. The foal, which was the produce of this connection, very exactly resembled the gelding in *colour* and in *shape*, and *very remarkably in the shape of the hind legs*, as above described.—p. 13.

As no sexual intercourse could in this instance have occurred, the resemblance of the foal to the gelding must be attributed to causes acting through the nervous system. The following example, as it describes the appearance of successive litters, is even more conclusive. It is copied by Dr Harvey from *Daniel's Rural Sports*:—

As the late Dr Hugh Smith was travelling from Midhurst into Hampshire, the dogs, as usual in country places, ran out barking as he was passing through the village, and amongst them he observed a little ugly cur, that was particularly eager to ingratiate himself with a setter bitch that accompanied him. Whilst stopping to water his horse, the doctor remarked how amorous the cur was, and how courteous the setter seemed to her admirer. Provoked to see a dog of Dido's high-blood so obsequious to such mean addresses, the doctor drew one of his pistols and shot the cur. He then had the bitch carried on horseback for several miles. From that day the setter lost her appetite, ate little or nothing; had no inclination to go abroad with her master, or to attend his call—but seemed to pine like a creature in love, and express sensible concern at the loss of her gallant. Partridge season came, but Dido had no nose. Some time after, she was coupled with a setter of great excellence, which, with no small difficulty, had been procured to have a breed from her: and all the caution that even the doctor himself could take, was strongly exerted that the whelps might be pure and unmixed. Yet, not a puppy did Dido bring forth, but what was the exact *picture* and *colour* of the cur that had so many months before been destroyed. The doctor fumed; and, had he not personally paid such attention to preserve the intercourse uncontaminated, would have suspected that some negligence had occasioned his disappointment; but his views were in many subsequent litters also defeated, for Dido never produced a whelp which was not exactly similar to the unfortunate cur who was her first and murdered lover.—p. 24.

Many other instances are brought forward by Dr Harvey, of cases affecting the fœtus through the imagination of the mother. These are all very clearly described. Our space, however, compels

us to refer our readers for them to the pamphlet itself. The little room we have left, we dedicate to a most striking fact adduced by Dr Harvey, which certainly seems to confirm the inoculation hypothesis, and which will, we dare say, be quite new to many of our readers.

It has often been a subject of remark, and sometimes of severe comment, that the aborigines of many countries have disappeared before the footsteps of the white man. This has been the case in Canada, the States, Mexico, South America, New Zealand, and Australia. That the cruel treatment of the aborigines by the Europeans, the introduction of European diseases, and of rum, were sufficient causes for this, we never believed. The real cause seems to have been brought to light by the celebrated traveller, Count de Strzelecki. "Whenever," he maintains, "a fruitful intercourse has taken place between an aboriginal woman and a European male, that aboriginal woman is for ever after incapable of being impregnated by a male of her own nation, although she may again be fertile with a European." The Count, whose means and powers of observation are of the greatest possible order, affirms, that "hundreds of instances of this extraordinary fact are on record in the writer's memoranda, all recurring invariably under the same circumstances." A natural question occurs, had the Count ever noticed any exceptional cases? Dr Harvey has put himself into communication with the Count, and the answer that he has received, is, that "it has not come under his cognisance to see or hear of a native female which, having a child with a European, had afterwards any offspring with a male of her own race." The accuracy of the Count's statement, upon this respect, as regards Australia, has been amply confirmed by other investigators; and the fact is one of the most extraordinary that is ascertained regarding the whole mysterious subject of reproduction.

We cannot refrain from adducing the following fact bearing upon this matter. The native families in New South Wales, living in the interior, swarm with children. A party of aborigines, of the number of 210, were deported by Government in 1835 to Flinders' Island, on account of the aggressions made by them upon the colonists in their vicinity; by whom, however, they had been contaminated. During the next seven years, the number of births was only fourteen.

To use the words of the Count, "Wherever the white man has set his footmark, there the print of the native foot is obliterated; and, as the tender plant withers before his tread, so withers the aboriginal inhabitant of the soil." The consequences of this law are great and obvious. The ultimate extinction of many varieties of the races of mankind seems to form part of the designs of nature; and it would appear that she intends to substitute them by generations of others. Thus it is, in particular, that the Anglo-Saxon race, that numbered some six millions only some two centuries and

a half ago, and that now counts some sixty millions scattered and increasing over every quarter of the globe, is destined first to destroy, and then to replace whole nations. It is, we are told, calculated that, in one hundred and fifty years, it will comprehend eight hundred millions of human beings.

In placing aside Dr Harvey's little production, we should not fulfil our duty did we not thank him for the trouble he has taken, in starting and investigating this very interesting and important effect of cross-breeding. It is, in many respects, creditable; and the investigation, we think, is calculated to terminate in something practically useful.

Flax Husbandry.—

The planting of hemp and flax would be an unknown advantage to the kingdom.—BACON.

If we could conceive it possible that any individual would undertake the formidable task of wading through the Budget speeches of the last thirty years, with a view to the acquisition of fiscal knowledge, we suspect he would find himself ultimately far less enlightened upon the subject-matter of his inquiry, than convinced of this lamentable fact—that the policy too frequently pursued by the Finance Minister of the day has been, to sanction the remission of imposts that ought never to have been disturbed, instead of adhering to that sound principle which should be constantly present to the mind of a considerate minister, that of devising sources of reproductive employment for an indigent population.

The reduction of wages, and the redundancy in the labour market, consequent upon Free Trade measures, ought to stimulate "the powers that be" to the development of some practical and comprehensive scheme by which a better state of things might be permanently established. At the present moment, we see private philanthropy actively and conspicuously in operation, to promote the transit of our industrious countrymen to other climes. Let us see how far another design might not, if duly encouraged, be as beneficially acted upon for enlarging the sphere of national industry at home.

It will, doubtless, be fresh in the public mind, that when her Majesty and the Prince Consort visited the sister kingdom in the summer of 1849, there was one event which, we are told, elicited more heartfelt gratification in the breast of our beloved Sovereign than any other circumstance connected with the royal tour. We allude to the royal visit paid to Belfast for the purpose of inspecting the productions of the Royal Flax Society, of which her Majesty is patron. On that occasion the Marquis of Downshire (the President) and other noblemen and gentlemen, members of the Committee, presented, in the name of the Society, a congratulatory address, in which, *inter alia*, were the following passages:—

We feel an honourable pride in directing your Majesty's attention to the happy

influence which the linen trade has exercised, in contributing to raise the province of Ulster to that comparative position of independence and prosperity, which contrasts so favourably with the distress and misery, whose existence we deplore, in other parts of Ireland.

We have been sedulously labouring to extend the culture of the flax plant to those poor and remote localities, as the £4,000,000 or £5,000,000 now annually paid to foreigners for the material, *if distributed at home*, would, by creating feelings of self-reliance among the people, tend to show them that the natural resources of the country are amply sufficient, if fully developed, to support her population, and would prevent them from looking for eleemosynary relief from strangers. From the sowing of the seed to the finishing of the woven fabric, all the operations of this branch of industry are performed at home, affording employment alike to the farmer, the agricultural labourer, and the artisan—creating an intelligent and enterprising middle class of manufacturers, the want of which is so much felt in other districts of Ireland—and, by the export of the products, contributing to the employment of our mercantile navy, and affording an item of exchange for the productions of foreign countries.

Well might her Majesty express to Lord Downshire the "extreme gratification" she felt, after having gone through the different apartments, and inspected the various stages of the plant, from the pound of unbleached yarn-thread, of the value of three halfpence, to the pound of unbleached thread, of the market value of thirty guineas!

And here, by the way, a little digression may be admissible, for the purpose of taking a brief retrospective glance at the legislative proceedings connected with this subject. Soon after the accession of Geo. III., we find an act was passed (in consequence of the great increase in the consumption of linens within Great Britain and the British dominions in America) for granting additional duties on the importation of certain foreign linens, a portion of which, "not exceeding £15,000 per annum," was to be set apart for the establishing of a fund for promoting the growth of hemp and flax at home; or, as it is more explicitly expressed in the preamble to the Act, (7 Geo. III. c. 58,) "the establishing a proper fund for the encouragement of raising and dressing hemp and flax would be *a great advantage to the linen manufacturers within this kingdom*," &c. A subsequent act (10 Geo III. c. 40) directs the annual distribution of the above sum: £8000 to be applied to England, and £7000 to Scotland. Another act, however, (27 Geo. III. c. 13,) revealed an untoward fact, namely, that the duties directed to be set apart for this praiseworthy object "had never, in any one year, amounted to the sum of £15,000; but, upon a medium of nineteen years, computed from the 5th of January 1768—being the year after they took place—the sum of £6,335, 15s., is taken to be the average amount of the annual produce thereof;" consequently, the latter sum became the amount of the fund annually applicable to the purposes expressed in the previous acts; the bounties to be continued for seven years from the 25th of March 1787, at the rate of 3d. for every stone of hemp, and 4d. for every stone of flax raised in Great Britain. This statute continued in operation till 1834: in the session of that year a minister of the Crown introduces a bill "to *repeal* so

much of several acts as authorises the issuing any sums of money out of the Consolidated Fund for the encouragement of the raising or dressing hemp or flax." The only word in the preamble authorising the measure being, that it was "expedient" that the said bounties should cease. The bill went through its respective stages, *sub silentio*, and all legislative encouragement for this species of British industry was thenceforth abrogated!

Returning to the culture of flax in Ireland, we find the increase in the growth, and the great improvement in the quality, consequent upon a visit of Irish farmers to Belgium some years since to to watch the mode of management in that country, have resulted in this fact: that foreigners from all parts of the world are now constantly visiting the sister kingdom to acquire information as to the process of "scutching" flax—a circumstance by no means surprising when we contemplate (in addition to the statement of the Belfast Society) the manifold benefits accruing from the culture of this invaluable clothing plant even upon a very small scale.

One of the most interesting circumstances, in relation to this subject, may be here alluded to, as having taken place a year or two since at Skibbereen, on the occasion of a public meeting convened for the purpose of forming a local branch in connection with the Belfast Flax Improvement Society, in order to promote the intended cultivation of flax in that union. The object was so far accomplished that the nucleus of a society was formed; and the meeting, composed of the clergy and leading gentry of the neighbourhood, were not a little edified by the stimulating remarks of the speakers, but especially by what fell from Mr Marshall, the Government relief inspector of West Carbery, who was called upon to give a description of the modes pursued in the north of Ireland in the cultivation of the flax crop. The following is a portion of Mr Marshall's speech:—

Having been bred up in a flax country, it had struck him that this district, and indeed the entire south of Ireland, did, within itself, possess ample resources for the removal of the destitution that pervaded the great mass of their population, by pursuing the cultivation of flax, for the growth of which their soil and climate were peculiarly adapted. The potato having now become an uncertain crop, the present was a time especially favourable for the introduction of the cultivation of flax into this part of the country, and all that was wanted was a little exertion among the gentry and proprietary, in order to procure for the people that knowledge respecting the proper management of this crop, of which they were now quite ignorant. In fact, flax, in this part of Ireland, was completely spoiled in all the stages of its culture, and was consequently an article of little value. In the first place, flax should not be grown on potato ground, but on stubble, which should be ploughed deep in the month of November, and let lie over till spring; then second ploughed, harrowed, and prepared fine and clean, and the seed (which should be Riga, when attainable) sown either in the last week of March or the first week of April; when sown later, the crop cannot arrive at maturity in proper season. It had been said that flax was a scourging crop: this was a mistake; for, if flax were grown on wheaten stubble, (the land of all others best adapted for it,) a crop of oats may then succeed the flax, and it would be found a better crop than if it had succeeded the wheat. The boles, too, were good food for cattle, and the water in which it had been steeped afforded a most fertilising manure. Mr Marshall then proceeded to say, that, in promoting the growth of flax, they would raise a product that would pay both land-

lord and tenant, and, above all, afford extensive employment to their people. Would to God (added Mr Marshall) that any of you, gentlemen, had witnessed the happiness and prosperity that, in the north of Ireland, are consequent on the cultivation of the flax crop; the farmer is largely benefited, and the labourer does not depend solely on his own wages for his support, for each member of his family is engaged in either spinning or weaving, or some other operation connected with the manufacture of flax, and thus contributes something to the common stock. All that is wanted, in order to promote some degree of the same prosperity in Skibbereen, is the diffusion of instruction upon the subject among your peasantry. The Belfast Society will aid you in carrying out this object.

In a letter addressed by Mr Hill Dixon to the Viceroy of Ireland, about four years ago, beseeching his excellency to encourage such employment for the people, the writer gives the following illustration of what is achievable from the produce of only *three* statute acres of flax, which had been purchased by an eminent cambric house for 15s. per stone, and pronounced by the firm to be equal, if not superior, to any foreign flax for which they had given 26s. A portion of it remained still to be delivered; in reference to which Mr Dixon says:—

Should this part be as productive as that already furnished, the entire produce of the three acres will be 120 stones, which, at 15s., will give to the farmer £90; but he has a certainty of 100 stones, which will realise him £75. This flax is now in process of conversion into cambric pocket-handkerchiefs, is capable of being spun to thirty hanks to the pound, and is to be spun by the hand. Mark, now, the employment this will give. It will afford constant employment for twelve months to 132 women to spin it; 18 weavers will be occupied a like period in weaving; and it will require 40 women a-year to hem-stitch (or vein) the handkerchiefs—thus giving constant employment for twelve months to 190 persons. It is curious to trace the result of the process which this flax is undergoing: it will produce 210 webs of cambric; each web containing five dozen of handkerchiefs; each dozen will be worth 40s.; and the entire, when finished, will be worth £2100.

To these instructive statistics we may superadd the impressive fact that the annual value of the crops in the flax-growing districts of Ireland is now estimated at upwards of two millions sterling. The following official return, compiled at the office of Public Works, Dublin, by Captain Larcom, shows the extent of flax cultivated in each of the Irish provinces during the years 1847-8-9:—

1847.—Ulster, 53,701 acres; Munster, 1156 acres; Leinster, 1644 acres; Connaught, 1811 acres. Total, 58,312 acres.

1848.—Ulster, 49,549 acres; Munster, 1249 acres; Leinster, 1239 acres; Connaught, 1826 acres. Total, 53,863 acres.

1849.—Ulster, 57,651 acres; Munster, 937 acres; Leinster, 741 acres; Connaught, 985 acres. Total, 60,314 acres.

The county of Donegal, we are told, produced in 1849 the greatest quantity of flax; but, in the county of Londonderry, its extent bore a larger proportion to that devoted to other crops than in any other county in Ireland, the proportion being one acre of flax to every fourteen acres of arable land.

If we turn to Scotland, where, in bygone days, flax was grown on almost every estate, we find a society, with Lord Aberdeen for its president, has been recently established, on principles similar to those of the Irish Society, for "reviving" the culture of the crop in that country; and, in a paper communicated to the Highland

and Agricultural Society by Mr Thomson of Banchory, that gentleman stated that he had been repeatedly in Holland and Belgium, and was much struck by the evident wealth and comfort of the small farmers in those countries. On inquiry, he found that their comfortable circumstances were "mainly attributable to the culture of flax."

To promote the culture of this plant in England, as well as in Ireland and Scotland, is, however, an object equally demanding national attention at the present moment, seeing that it is actually more profitable than growing corn. In proof of this, we may remark that there exist many experienced agriculturists, in different counties, whose annual practice furnishes indisputable evidence, that not only in a social, but in a pecuniary point of view, flax "will answer to grow it." Here are two or three instances. Mr Sotheron, the member for North Wilts, made the following communication at the anniversary meeting of the Chippenham Agricultural Association in 1848 :—

It was well known (said Mr Sotheron) that he had for the last two years taken a considerable interest in the cultivation of flax. He had with him a specimen of linen grown from flax on his own farm, hacked and dressed and spun at home. The great question was, whether it would answer to grow it ? He would not give them figures, but he would tell them that at that moment flax was an article at a very low price. He had expended £14, 10s. on two acres in labour ; and the produce had realized £13, 10s. per acre. He did not to say that it was the price which he had thought of ; but the main point was this, *it enabled them to afford a very large field of labour to persons for whom there was now great difficulty to find any work, particularly in the winter.*

Mr Beale Browne, the proprietor of flax-works in Gloucestershire, in a published letter, (March 1849,) detailing a series of rules for the guidance of flax-planters, concludes with the following useful information :—

I have proved the Cotswold Hills can grow good flax, and the demand is increasing daily. A more beautiful sample than two waggon-loads sent to me yesterday by Sir T. Tancred, cannot easily be seen ; and let me also add, *the vast amount of labour the cultivation of this plant gives, which should be a consideration in these distressed times.*

Mr Dixon and Mr Ward (members of the Royal Agricultural Society) have likewise confessed to the realising a clear profit, after deducting every expense, of £21 in one case, and of £23 to £24 per acre in another. We remember, also, to have read an account of the proceedings at an agricultural meeting at Scarborough, about three years since, when one of the speakers stated that he had grown forty acres of flax, and cut it green at £9 per ton ; not, he said, that this was a full return for the produce of his soil, but because of "the excellent crops of clover which he found he had after it." Innumerable instances, indeed, might be cited to disprove the popular prejudice of flax being a "scourging" crop. It may suffice to refer to such authorities as Lord Erne and Sir Robert Kane in Ireland ; Lord James Hay and Captain Dalrymple in Scotland ; and the individuals already quoted,

always including, moreover, the extensive experience of Mr Warnes of Norfolk.*

Again, if we contemplate this important subject in another point of view, the following startling data are represented to us. It is asserted that a sum little short of £6,000,000 is annually expended in the purchase of *foreign* flax. The yearly consumption of this material for the London trade is computed at 120,000 tons. If this were grown *at home*, it would occupy 400,000 statute acres; the value of the crop would be £6,500,000, and that of the seed £1,400,000—making a total of nearly £8,000,000.

But foreign flax is permitted to be imported at a nominal duty, Russia enjoying the advantage of British legislation in her favour to the extent of *three-fourths* of the entire quantity annually imported; while Holland and Belgium, Prussia and Egypt, stand next in the order of favoured contributors.

What, then, is the course which the foregoing facts naturally suggest? Do they not significantly point to the expediency of re-imposing the duty upon foreign flax, and of renewing, upon a more liberal scale than heretofore, the legislative encouragement to increase the cultivation of this valuable clothing plant throughout the United Kingdom? By such a course the undermining efforts of the foreign competitor would be destroyed, and a wide field opened for the permanent employment of tens of thousands of our countrymen and their indigent families.

Characteristics of the year 1850.—By Mr TOWERS, Croydon. I propose, on this occasion, to follow up the plan adopted in the last year, and to divide each month, as nearly as its meteorology will admit, into three portions, wherein the barometric and thermometric averages, the prevailing winds and their force, the condition of the atmosphere, and the prevailing weather, will be stated. This year is considered to have been peculiar; on the whole, (locally at least,) exceedingly dry; so much so, that the springs have been, and remain, very low, many of the wells having been destitute of water for three months of the autumn. The temperature has been low, with occasional protracted absence of sun; but not further to anticipate, I come at once to particulars.

January.—First period, the 10th day inclusive. Barometer above 30 inches on five days, average of the ten, 29 in. 94 cents. Temperature, average of night, 30°.2, of the days, 35°.5. Wind, westerly by north or south during the first five days; then north-easterly, gentle in force, atmosphere mostly gloomy, overcast, three sunny days. Scarcely any rain, and a mere hint of snow. Solar spots (maculæ) observed on the 5th.

Second period, includes eleven days, because the easterly winds, [illegible]h commenced on the 10th, prevailed (with the exception of

* The recommendation of the culture of flax does not at all depend on its being [illegible] that is [illegible] scourging to the land, which we regard as a complete fallacy.—ED.

the 19th) throughout. They came in rather forcibly, but lulled almost to a calm on the 16th. The barometer declined a few cents till the 20th, then it rose to 30 inches, and to 30.35 cents in the evening of the 21st. Temperature of the eleven nights, nearly 29° of the days, barely 32°—on the whole below an ordinary average. This was a period of gloom and of frequent falls of a little snow, scarcely sufficient to cover the wheat.

Third period, to the end—a complete change of wind to west, south, or north-west till the 29th evening. The sun appeared now and then, and a few spots were seen on the 27th. The barometer was read off at 30 in. 48 cents on the 22d, at 30.42 cents on the 27th, and its average was far above 30 inches throughout. The lowest average of the ten nights, 34°—the highest of the days, nearly 42°.

January thus may be called a cold and gloomy month, but certainly dry. In France and Italy, we read of intense frosts, and exceedingly deep snows.

The condition of all the winter crops on the ground appeared very promising; there was no degree of frost to effect any injury, and yet, the temperature was sufficiently low to prevent any great luxuriance of the young wheat.

February.—The character it assumed, at least in North and East Surrey, was extraordinary; and, for the sake of convenience, I divide it into two portions only. In general, it is considered to be a wet month, and to which tho old *saw*—“ February fill dyke,” is appositely applied. By the few appeals I shall make to my diary, it will perhaps appear to be one of the blandest, most gentle, and equable months of the year 1850. The first days were dull and overcast, followed by twelve mild and generally clear, with a prevalence of sun, on whose disc small spots were discerned, on the 3d, 5th, 10th, and 12th. The wind came from some western point, generally by south; the current often being lively. There were showers on seven of the days—with hail on the 12th day—alternating pretty nearly with as many fine days. The instrumental averages were noted by me—barometric column about 29 in. 72 cents; thermometric temperature in the nights, 37°.8—days, max. 40°.

Second period, 15th—28th, inclusive. In this my diary notes, thirteen fine—that is, dry days—of which, however, four only were sunny, five were completely overcast; tho three last, 26th, 27th, and 28th, hazy—the 20th alone proved very rainy—on the 23d we noticed a lunar halo. The wind generally blew from some western point, but it veered to east, by north and south. The leading phenomena, however, was the high position of the barometer; the average being 30 in. 21 cents. The average lowest temperature, I quote at 47°.2—the highest 50°.83.

These data are altogether extraordinary for the fickle month of February; and particularly if the very small quantity of rain, according to the estimate in the *Gardeners' Chronicle*,—namely,

$\frac{9}{100}$ths of an inch—be taken into the account. The wheat began to look more gay; nor was this surprising, when the all but total absence of frost is considered—31° of Fahreinheit, on the 13th morning and evening, being the lowest degree marked here!

We now approach a still more important and critical period,

March.—Its meteorology admits of no regular periods. The three first days were mild—42° to 54°; the barometer fell from 30 in. 30 cents on the second, to 29 in. 68 cents on the third evening; wind south-west. Then the current varied to N. by E.; and drying winds continued till the twenty-first evening, varying in force, but, upon the whole, gentle. I cannot retrace a period of eighteen consecutive days wherein the mercury stood so consistently high. On the 5th day I read off 30 in. 40 cents; 6th and 7th, 30 in. 50 cents; on the 12th to 15th, 30 in. 51 cents to 30 in. 40 cents; and intermediately it was always far above 30 in. On the day of the *vernal equinox*, (nearly midnight of the 20th,) it had receded to 13 cents, but recovered the altitude of 30 in. 20 cents. We had eleven sunny days, and on seven of them I observed solar maculæ. Rain occurred twice. The mornings of 5th, 12th, 13th, 16th, and 17th, were frosty, with rime only; the days 10° to 12° warmer—one only marking 56°; there was a recurring tendency to morning haze and fog, and occasionally to that consistent sunless gloom which became a feature of the spring and summer. The *equinox, as a prognostic*, was certainly favourable; yet it wavered, and appeared indecisive in its character, and the summer will, I believe, be thought to have corresponded with the indication. The average night temperature of the whole month was about 33°—one degree above the freezing point: the maximum only 45½°. A change in the weather took place about noon of the 22d; rain fell in the night. Snow-showers on the 24th, with piercing wind; and again, on the 27th, there was snow, followed by keen frost on the 28th, which, however, soon passed away, leaving the weather a good deal meliorated. The quantity of rain, as estimated at Chiswick, was only 0.13 cents of an inch.

March, therefore, was the coldest and driest month of the year: and thus a check was given to the progress of vegetation. This check was never completely compensated as to time, though the positive injury incurred was *nil*, when compared with that inflicted by the immense snow and cutting frost of April 16th and 17th, 1849.

April sustained its usual showery character, to the end, at least, of the third week, during which my diary registers sixteen days or nights wherein some rain fell. The prevailing wind was southerly by west till the 10th, then it veered for a few days by south-east, reverted to a westerly point, and became easterly in the last week, the temperature declining to two or three degrees below its average. The force of the wind varied as usual; in general it amounted to little more than a gentle air, but

advanced to a lively breeze, becoming almost a gale on the 3d or 4th, 27th and 28th. The atmosphere was pretty clear; with sun on nine occasions within the first three weeks, and became much more sunny during the last ten days, when there were only one or two showers. On the 21st, clouds and gloom predominated, which tended to keep down the temperature. Solar spots were absent on the 5th and 9th, but always present when an observation was subsequently taken.

The range of the barometer, during the twenty-three first days, I quote between 29 in. ·05 cents, the lowest, and 30 in. ·04, the highest—the average being 29.55, which agrees pretty nearly with the point usually marked "*changeable*" on the engraved plates of our instruments. The mean lowest temperature of all the nights appears to have been (at Croydon) 43°·9, which is nearly 3° below the estimated mean of nine seasons at Greenwich. Unfortunately, the greatest depression occurred after the 23d, coincidently with the setting in of cold easterly wind, and the great rise of the mercury to 30 in. 13 cents or more, the average temperature being then reduced to 40° !

The highest temperature of the days was observed, on the 2d (62°), on the 7th (63°), and on the 11th (62°)! the mean maximum of the entire month being a fraction, only, above 56°, which, added to the night temperature (say 44°, to avoid fractions) gives exactly 50° as the total mean. This rather exceeds the Greenwich estimate; *that*, however, had been much reduced, by including the mean of the bitter cold April of 1849—*i. e.* 42°.2! As a closing remark, I may just state that, at the end of April, the "oak buds were plentiful, *in advance* of the ash!" The condition of the ground throughout the month was favourable to all the operations of preparation and spring-sowing, and of this the best farmers availed themselves.

May.—The prevailing weather will mark the periods into which I must divide this month. Thus, the eight first days comprise that unsettled state which is termed changeable; for in it there were five showery or wet days, but only three without rain, and with more or less sun. The winds were fluctuating between north-east and westerly. The barometer stood some tenths of an inch above 30 inches till the evening of the 4th, then it fell to changeable, or thereabout. The mean temperature of eight nights was 39°; that of the day maxima, very nearly 51°. Slight frost, indicated by rime, was on the herbage on the 3d, which touched the haulm of early potatoes in a few places.

The *dry* period extended from the 9th to the 21st, both inclusive. In it, a rather northerly current prevailed, sometimes veering by east, at others by west—occasionally there were southwest breezes. My table registers eleven fine days, many of which were bright; on four of them I saw spots on the sun's disc. A few showers fell on the 12th; and, after a little hail on the 15th,

an early frost occurred on the 16th morning. The barometric range was between 29 in. 67 cents, and 30 in. 10 cents on the 14th. *Third*, or rainy period, 22d to the 28th, during which the barometer declined from 29 in. 70 cents to 29 in. 50 cents, every day being more or less showery. From the 28th to the end, the mercury rose from 29 in. 90 cents to 30 in. 20 cents, those four days were also fine, and generally sunny—mid-day temperature of the 31st = 70°. The mean averages of the entire month were 42° minimum—59.22 maximum. The temperature had progressively meliorated till the 29th, when the east wind setting in, reduced that of the nights and early morning.

My diary, at its close, has the following note:—"Oaks in full leaf, ashes little so."

June commenced as May had closed. High state of the barometer till the 4th, average about 30 in. 18 cents, wind easterly; and here it may be observed that, throughout the spring, there was no run of a north-easterly current; the weather, indeed, was unwontedly dry, but never parching! The month divides itself into two principal periods after the first four days—namely, *First*, from the 4th to the 16th—wherein the mercurial column declined to the mean of 29 in. 76 cents, the greatest depression being 29 in. 50 cents on the 14th. The thermometric averages were—51°.66 minimum, 67° maximum. The prevailing winds were south-westerly—brisk on the 6th, 7th, 12th, and 13th; and then there were showers. The other days were generally fine, with a fair proportion of sun. Hay-making commenced with us about the 8th or 9th.

Second period.—The barometer ascended rapidly after the 15th; so that, between the 16th and 27th, both inclusive, the average mean was 30 in. 15 cents: it then declined, so that the mean of the three last days fell to 29 in. 82 cents. The temperature of the 15 days averaged, minimum, 53°.6—maximum, 72°.4: thus the nights were cold—in one instance (16th) the potato herbage was a little injured by a frosty rime, followed by brilliant sun. The winds fluctuated much till the 24th, when an easterly current set in for four days. On the 26th, after haze, the heat at 78° became oppressive, with thunder, and the weather became unsettled. I marked the following items:—"17th, oats and barley in ear; wheat fine—in flower on the 25th." This was late, and proved that the average general temperature of the quarter had been low. The exceeding drought of the half year is verified by the Chiswick table of the fall of rain in inches and decimal parts—

1850.	Inches.
January, . . .	1.43
February, . . .	0.95
March, . . .	0.13
April, ...	1.79
May, ...	1.84
June, ...	0.39
	6.53

July produced its usual rains, but they were not equally distributed. The month divides itself fairly into two periods. The *first* includes sixteen days, during which there was not, *here*, either one hot day or one genial night, till the 14th, when the thermometer marked 58° at the lowest, on the self-registering scale, and 70° as the maximum. The average of the 16 days were taken at 52.1—lowest, 69° (less a mere fraction) for the day maximum. The barometer fluctuated between 29 in. 70 cents and 30 in. 15 cents, the latter only for a few hours on the 5th evening. The wind was south-westerly till the 5th, passing to S.E. and N.E. for two days—subsequently to N.W., till the 12th, when it became easterly, with a lively current on the 13th, 14th, and 15th, with a great increase of temperature. The 15th, every one knows, is the dreaded *modern* St Swithin—*i. e.*, of the new style: that day proved, to all appearance, one of the most splendid of the summer—78° temperature; barometer 30 inches, but falling; wind easterly by south—by north in the evening. On the 16th it became unsteady, ending in a S. W. lively current. This was the hottest day; there were "*heavy rocky* cumuli in the north and north-east, which dispersed at sunset, when streamers of cirro-stratus rose from S. W. to the zenith." Heat 82°, falling to 71° at 10 P.M. In this period some rain fell on the 4th, 7th, and 11th; all the other days were fine, though not generally brilliant; but the phenomenon of *black* diffused rays, passing from the illuminated gilt edges of a western cloud, were observed as a threatening token on the 8th and 14th.

Second and *wet* period—for the 17th commenced with haze, variable wind—followed by vast cumulous masses—gloom, and oppressive heat at 78°—a few rolls of distant thunder, but with only a few drops of rain. The weather was broken up, small rain fell for some hours on the 18th till noon, hot sun broke forth, then heavy masses of clouds formed gradually, and prodigious explosions of thunder were heard at 5 P.M., not remote from Croydon, which produced a good quantity of close, but not heavy rain. In this period I noted only five dry days, two of which (30th and 31st) were sunny, the barometer then having risen to 30 in. 15 cents. Previously the mercury had averaged fully 29 in. 80 cents, its lowest depression in the 25th night being 29 in. 65 cents. After the storm the temperature was reduced, though there were occasional accessions of heat, as on the 22d to 78°; 23d, 83°; 31st, 75°. Thunder and heavy showers, gloom with great variations of wind, characterised the latter weeks of the month. The averages of the thermometer were 56°.8 by the nights, 70°.26 by the days. The harvest had not advanced as had been hoped. Rain had been much wanted; but, when it came, the sun failed us.

August presented a motley character, and may be divided into dry and wet periods, each of short duration. The four first 's barometer marked 30 in. .09 cents; wind south-westerly,

though partially cloudy; day heat, 65° to 77°. From the 5th to 12th inclusive, more or less rain fell, excepting the 11th; heat reduced to about 69°; wind generally west by south; more fitful in strength. On the 13th fine weather set in, and continued till the 20th evening. A rainy period came in on the 21st, (wind passing from south-east to north-west and to south-west,) and continued till the 27th. A good deal of rain fell, and thunder, with hail occurred on the 24th. There were, however, several finer harvest-days.

The barometer rose again to above 30 inches on the 28th, and the month closed with the mercury at 30 in. 30 cents; wind west by north. The temperature of *all* the nights was pretty equable and genial till the 27th, when it stood at 48°, declining to 43°—the average mean of the nights was 53°. 7., that of all the days, 68°.12.

I noticed, at the time, that wheat-harvest began on the 6th, four days later than was reported from Berkshire. On the 17th, much had been carried in good order. On the 24th, being Saturday, a day after full moon, great efforts were made, and the major part of the sheaves had vanished from the fields. The quality, I firmly believe, (and so I was assured by good judges,) to be fine. Barley, in some places, was much cut up by the hail and driving winds—oats very good—pease not abundant—beans better.

September.—This autumnal month divides itself into two rather unequal periods, in consequence of the striking differences in their barometric indications. The *rise* of the mercury commenced on the 28th of August, and the decline did not take place till the 17th night instant, when, from 30 in. 25 cents, it reduced the mark to 30 in. 10 cents. The highest rise was to 30 in. 40 cents on the 7th and 8th, the mean of the 22 days being about 30 in. 30 cents. The wind was westerly by north on fair days of the first week—easterly by north till the 18th; the whole period was gloriously fine and summer-like, bringing the entire harvest to a joyous termination. The mean of thermometer observations was 47°.1. minimum, 65°.47. maximum.

Second.—The 18th to the 30th both inclusive. The barometer ranged between 29 in. 90 cents on the evening of the first date, and 29 in. 30 cents on that of 30th. These were the two extremes; but the average mean was about 29 in. 71 cents.

The averages of temperature gave 51°.4. by night, 63°.7. by day observations. The wind went by the east to south on the 19th, to west, fluctuating between that quarter and south generally; gentle in force till Michaelmas day, (29th,) when it blew almost a gale. Nine of the 13 days were more or less rainy, four pretty fine, several quite overcast.

Now as to the Equinox of the 23d, when the sun entered *Libra* at 10 A.M. The wind had gone backward to east, but returned to ... west by north. Barometer falling, weather rainy, followed

by much more wet on the 24th. Solar spots always observed at bright intervals. The indications were certainly favourable to a mild, changeable winter.

October allows of a division into three unequal periods ; the first comprises the seven first days, wherein the barometer was low—that is, between 26 in. 20 cents, and 29 in. 90 cents, the thermometer ranging between 41°, the lowest point on one occasion, and 60° as the maximum on another. The wind was south-westerly, and the weather correspondingly changeable and rainy.

The *second* or dry period comprises the days between the 7th and the 19th, when the barometer having ascended to 30 in. 34 cents on the 12th, fell below 30 in. in the night of the 18th. The night temperature declined much, that is, to between 34° or 35° and 46°. The wind westerly by north, or even northerly, only one showery day is registered among the twelve or thirteen that were fine ; but not of sunny character.

Third period.—This was changeable in its instrumental and meteoric phenomena. The barometer declined from 29 in. 97 cents on the 19th, to 29 in. 18 cents on the 24th, with fluctuations, when it rose irregularly to 29 in. 96 cents on the 31st. Rain, as showers, or more continuously, fell on eight days with six finer ones intervening. Thus, at length, the deeply arid earth became somewhat moistened ; securing not only one of the finest wheat seasons, but a rapid improvement of swedes and turnips. Six or seven nights of the last ten, and one or two in the middle of October were really cool, and frosty rime was observed occasionally. The mean average of all the nights, I calculate at 41°. 1., of the days 52°. 5.

November embraced three irregular periods ; the first included seventeen days, fifteen of which were characterised by a high state of the mercury ; the entire mean being estimated at 30 in. $\frac{102}{1000}$ths ; the remaining two (1st day and 9th night) forming the only exceptions. The temperature was, upon the whole, mild and equable, though the nights of the 14th and 15th were slightly frosty. Still, however, the mean averages were 42°·3 minimum ; 52°·7 as the maximum. Twelve days were free from rain, some very sunny. A *second or rainy* period included the 18th and the 27th. A pale, extensive *lunar halo* was remarked in the evening of the 16th ; and this indicated the approaching meteoric changes, which were followed by the gales and storms of the 18th to the 20th, recurring again on the 24th and 25th from the south-west. The average of the barometer with me (and my instrument was high) was 29 in. 51 cents. ; the greatest depression happening in the night of the 19th and 20th—28 in. 74 cents on the 27th. A change of wind from the south took place, first to north, and in the night to easterly. Fine weather, with frosty mornings, was established ; the barometer making 30 in. 21 cents. The lowest degrees of temperature, on my instruments, were read off at 4° of

frost on the 15th and 30th mornings. The mean temperature of the thirty nights was, nearly as may be, 40°—of the days, 49°.99—the middle term of which is, at a close approximation, 45°, being $2\frac{1}{10}$ above the average of the month; namely 42°.9, as cited in the *British Almanac*. As a general remark, November, instead of gloom, presented a season of extraordinary cheerfulness to the middle of the month; it also retained a dry character. Rains came on in tolerable abundance after the 17th; but the ground had been deeply dry, whence the extreme lowness of the springs and wells. The wheat plant was scarcely seen in some places, and remained low in all, partly in consequence of tardy sowings; for the practice has been adopted, under the belief that thereby over-luxuriance (called by some *winter pride*) is avoided.

December.—The barometer was high during the ten first days, at an average of 30 in. 24 cents. Temperature cool, but mild; the lowest marks with me being 30° and 36° on the 9th. Wind always gentle, or even calm, toward south-west on the 3d to the 7th, easterly to the 10th. The weather was generally dry; but some rain fell on the 1st and 4th. A steadfast haze, very cold and damp, commenced on the 8th, and introduced the gloomy stages of the month.

Second period, 11th to 20th, during which the mercurial column fluctuated between 30 in. on the 11th morning, and 28 in. 98 cents on the 15th. The wind was south-westerly till the 19th, lively, and very strong on the 15th and 16th, when much rain fell, and some trifle of snow. My thermometer marked 32° degrees on the 11th and 18th; and the general temperature of the nine days averaged about 41°.7.

Third period.—When the wind veered to the north-east on the 19th, some rain and sleet fell; and the evening became cool, with frosty air. The barometer rose, on the 20th, to 30 in. .04 cents, and 30 in. 24 cents, thence it progressively rose to 30°.52 on the 22d and 23d, the weather clearing. I marked 6° of frost (26° Fahr.) about sunrise of the 21st; and we had frosty rime on the herbage each morning till the 26th; but there was little or no continuance of frost during the day. There were eight dry days between the 20th and 30th, and two wet ones. With the return of south-westerly and west winds on the 24th, the temperature softened gradually, till it rose to 52° on the two last days of the month. The barometer gave way on the 29th, falling from 30 in. 29 cents to 29.75, at which I read it off for the last time at 10 P.M. of the 31st. The weather became moist and rainy, and the night closed with boisterous wind from the south-west. The night and day averages of the whole month were 34° lowest, 43° highest. This extraordinary year, the fiftieth of the nineteenth century, will now be recorded, in our meteorological tables, as an epoch. In agriculture, not one of its predecessors afforded prognostics of surpassing [illegible] a few weeks before and after midsummer, when,

however, in the first instance keen nights produced a check; and, in the second, severe and boisterous storms threshed the grain crops, and reduced their yield in quality, if not in quantity.

At present, the plants on the ground afford a good prospect. Frost may be wanted, and will doubtless recur in due time. Hitherto, however, the equinoctial prognostic has been carried out; and with this retrospective observation, I bring this paper to its close, hoping that the new year may be blessed; that it may witness seasonable abundance; and that there "may be no complaining in our streets."

*Brown's Forester.**—Perhaps in no branch of rural economy has literature had less effect on practice than in arboriculture. It is not because there is a lack of books on forestry that so many ill-managed plantations exist in this country, but rather because the labours of literary arboriculturists have been too little appreciated, and their counsels too much set at naught. It is true that several writers on forestry have propounded rules which it would be better to disobey than to observe, but then, no general excuse for abiding by local and empirical practices ought hereon to be based. In penning these remarks, we would guard ourselves against the imputation of being merely the echoers of former complaints on this subject. When once it becomes fashionable to declaim against deficiencies of practice in any art, men are liable, from habit, to continue declaiming, even when the tide of improvement has begun to flow; and then, after the advancing of the waves has become a familiar subject of observation, the other extreme is often fallen into, undue praise is substituted for undeserved blame, and we begin to expect greater things than can reasonably be looked for. The recent progress of scientific agriculture has given rise, in the minds of many, to anticipations of perfection that may not be realised; but arboriculture is still at the stage which requires marks on the sand to prove whether the tide has really begun to flow or not; and hence, though convinced that arboricultural improvement is really making progress, we were induced to commence this article in the language of complaint.

Three years ago, a handbook on the management of plantations was published by Mr James Brown, forester, Arniston; and though it confessedly was deficient in many things, yet it has not been without effect in forwarding arboricultural improvement —one token of this being that, since its publication, the author "has been extensively employed by landed proprietors, in various parts of England and Scotland, in surveying and reporting on

---

* *The Forester; a Practical Treatise on the Planting, Rearing, and General Management of Forest Trees, &c.* By James Brown, Forester, Arniston. Second edition, enlarged.

the present state and future management of plantations." More than one practical surveyor of woods has of late been similarly employed; and the demand for accomplished foresters is great and increasing—all tending to show that landed proprietors are awake to the importance of the forester's art. A new edition of Mr Brown's work, greatly improved in every respect, has just issued from the press. It extends to upwards of five hundred pages, and contains a lithographed diagram, and more than a hundred wood-engravings. With regard to the diagram, which shows an approved method of planting trees in rows, it must be of use as a general guide to the planter; but where there is a prospect of a plantation being permanently under the management of a good forester, irregular planting, by which no tree is condemned to speedy removal till it be seen how it thrives, is undoubtedly the preferable mode. Row planting places the forester in leading-strings, unless, like Mr Brown, he disregards regularity in thinning when the trees are found thriving unequally.

The first chapter treats of the importance and prospects of forestry, the value of wood as a crop upon land, the laying out of ground for plantations, and the formation of different kinds of fences. Chapter II. relates to the preparing of ground, draining, formation of roads, and of the habits and peculiarities of the different kinds of trees generally cultivated. This is followed by a chapter on modes of planting, and of rearing trees in nurseries. Chapter IV. is devoted to the important and much neglected subject of thinning and pruning. Then comes the management of coppice, together with the preparation of bark for tanning. Chapter VI. is of a miscellaneous character, referring to the diseases of trees, the increase of timber, and the mode of estimating the value of growing plantations. The concluding chapter contains remarks on transplanting large trees, and some general observations on the management of woodland. The Appendix is interesting and valuable, comprising as it does reports on the state of existing plantations, mostly at considerable altitudes.

Mr Brown is an advocate of close or thick planting, followed, of course, by timely thinning. Especially, he recommends thick planting in unsheltered districts, and in places where there exists a demand for young and slender trees for palings, and other purposes. He admits that thick planting has been the first step towards the ruin of many plantations, but lays the blame on the want of thinning at the proper time. In a recent controversy on thick and thin planting, Mr Brown bore a part. We have not time nor space to enter into the merits of this controversy, but would remark that it served to illustrate one thing, namely, the danger of verging to extremes, when opposite theories are held up to commendation by different parties.

In the section on the causes of disease or rot in larch trees,

drainage, providing against the lodgment of stagnant waters in the soil, is recommended as a preventive. Other minor causes than that here indicated, however, exist. As one instance, we may allude to the almost certain failure of young larch plantations, if they succeed old plantations of the Scots pine. The decaying roots of the pine seem to act injuriously.

This is essentially a practical work. It comprises the experience and opinions of an enthusiastic arboriculturist. Perhaps those who are, more or less, acquainted with the subject, may think that the author descends into too many minute details regarding his modes of practice; but this may render the work all the more valuable to the young and the inexperienced. There are many facts stated, moreover, which must make the volume highly useful to the professional man, as a book of reference as well as of instruction. And if he cannot coincide in every opinion that is expressed in its pages, this may lead him to exercise thought and observation, by which means he may come to know whether he or Mr Brown is right. We believe that Mr Brown would rejoice if his volume were to become the means of leading his brother foresters to think and judge for themselves, rather than if they were to receive all that he states in a passive manner. The volume has been issued with a handsome external appearance, and will doubtless find a place in the library of the landed proprietor, as well as in the bookcase of the gardener and forester.

AVERAGE PRICE OF THE DIFFERENT KINDS OF GRAIN,

PER IMPERIAL QUARTER, SOLD AT THE FOLLOWING PLACES.

LONDON.

Date.	Wheat. s. d.	Barley. s. d.	Oats. s. d.	Rye. s. d.	Pease. s. d.	Beans. s. d.
1850.						
Dec. 7.	42 7	26 6	19 2	24 6	31 5	29 6
14.	43 4	26 11	18 9	24 3	32 0	29 9
21	43 4	26 8	18 8	24 9	28 11	28 6
28.	44 6	26 2	19 0	24 10	31 2	28 2
1851						
Jan. 4.	42 1	24 10	18 10	25 0	30 0	27 9
11.	42 8	24 6	19 0	24 0	30 0	27 1
18.	42 0	24 11	18 4	24 2	27 10	27 3
25.	40 10	23 2	18 5	23 8	30 0	27 5
Feb. 1.	41 8	25 10	17 9	23 6	28 6	28 2

EDINBURGH.

Date.	Wheat. s. d.	Barley. s. d.	Oats. s. d.	Pease. s. d.	Beans. s. d.
1850.					
Dec. 4.	41 3	24 5	18 1	[illegible] 6	[illegible]
11.	39 11	24 6	18 2	[illegible] 2	[illegible]
18.	39 9	24 0	18 7	[illegible]	[illegible]
25.	38 9	24 8	18 8	27 6	[illegible]
1851					
Jan. 1.	38 7	23 6	18 7	27 6	[illegible]
8.	38 6	23 10	18 6	27 0	27 [illegible]
15.	38 1	23 6	18 2	27 6	[illegible]
22.	37 7	24 5	18 0	27 9	[illegible]
29.	37 10	25 0	18 2	27 5	27 11

LIVERPOOL.

Date.	Wheat. s. d.	Barley. s. d.	Oats. s. d.	Rye. s. d.	Pease. s. d.	Beans. s. d.
1850.						
Dec. 7	40 0	24 6	18 5	24 2	29 6	30 9
14.	39 9	23 10	18 7	24 6	29 4	27 8
21.	40 6	25 1	18 5	24 10	29 1	28 7
28.	39 3	24 9	18 0	24 0	28 8	25 6
1851.						
Jan. 4.	39 2	25 4	17 7	24 2	28 6	24 7
11	39 2	25 8	17 3	23 10	28 4	24 4
18.	38 11	24 6	18 7	23 6	27 9	27 8
25.	39 0	25 4	16 10	23 9	27 0	26 7
Feb. 1.	39 9	25 1	16 11	23 4	27 3	27 1

DUBLIN.

Date.	Wheat, p. barl. 20 st. s. d.	Barley, p. barl. 16 st. s. d.	Bere, p. barl. 17 st. s. d.	Oats, p. barl. 14 st. s. d.	Flour, p. [illegible] s. d.
1850.					
Dec. 6	23 8	12 10	10 8	9 10	14 [illegible]
13	23 0	13 2	10 6	10 1	14 [illegible]
20.	22 8	12 9	10 9	9 7	14 [illegible]
27	22 5	13 3	10 9	10 0	14 [illegible]
1851.					
Jan. 3.	23 0	12 9	11 1	9 5	14 [illegible]
10.	23 1	13 1	10 8	10 1	14 [illegible]
17	22 6	12 11	10 10	10 4	14 [illegible]
24.	22 6	12 9	10 5	9 7	14 [illegible]
31.	22 6	12 10	10 7	9 6	14 [illegible]

TABLE SHOWING THE WEEKLY AVERAGE PRICE OF GRAIN,

Made up in terms of 7th and 8th Geo. IV., c. 58, and 9th and 10th Vic., c. 22. On and after 1st February 1849, the Duty payable on FOREIGN CORN imported is 1s. per quarter, and on Flour or Meal 4½d. for every cwt.

Date.	Wheat. Weekly Average. s. d.	Wheat. Aggregate Average. s. d.	Barley. Weekly Average. s. d.	Barley. Aggregate Average. s. d.	Oats. Weekly Average. s. d.	Oats. Aggregate Average. s. d.	Rye. Weekly Average. s. d.	Rye. Aggregate Average. s. d.	Pease. Weekly Average. s. d.	Pease. Aggregate Average. s. d.	Beans. Weekly Average. s. d.	Beans. Aggregate Average. s. d.
1850.												
Dec. 7.	40 2	40 2	24 7	24 3	17 7	17 3	24 9	25 3	29 0	29 3	28 9	28 9
14.	39 9	40 1	24 3	24 4	17 1	17 2	25 11	25 8	29 5	29 4	27 11	28 7
21.	39 5	39 11	23 10	24 3	17 1	17 3	23 1	25 1	28 2	29 0	27 8	28 6
28.	38 10	39 9	23 5	24 1	16 6	17 1	22 8	24 10	28 1	28 10	27 6	28 2
1851.												
Jan. 4.	38 3	39 5	23 4	24 1	16 11	17 1	27 5	24 6	28 1	28 8	27 3	27 11
11.	38 1	39 1	22 9	23 8	17 2	17 1	22 1	24 3	27 0	28 3	26 9	27 7
18.	38 0	38 9	22 6	23 4	16 9	16 11	24 8	24 3	26 11	27 11	26 7	27 3
25.	38 0	38 5	22 7	23 1	16 7	16 10	23 2	23 10	27 5	27 7	26 4	27 0
Feb. 1.	37 10	38 2	22 9	22 11	16 6	16 9	22 7	23 9	26 6	27 4	25 11	26 4

FOREIGN MARKETS.—Per Imperial Quarter, free on board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1850.		s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Dec.	Danzig	35 0 - 43 0	14 0 - 17 3	10 0 - 13 6	20 0 - 24 0	20 0 - 25 0	20 6 - 24 6
1851 Jan.	Danzig	34 0 - 46 6	13 6 - 17 0	10 0 - 13 0	18 6 - 22 0	20 6 - 26 0	20 0 - 25 0
Dec.	Hamburg	34 0 - 41 0	15 0 26 0	13 0 - 17 0	20 6 - 26 0	22 0 - 23 0	20 0 - 24 0
Jan.	Hamburg	32 0 - 39 0	16 0 - 22 0	12 6 - 14 6	20 0 - 24 6	21 0 - 27 0	20 0 - 24 6
Dec.	Bremen	32 0 - 39 0	12 6 - 17 0	9 6 - 11 6	20 0 - 25 6	21 0 - 26 0	20 6 - 24 0
Jan.	Bremen	31 6 - 37 6	12 0 - 16 6	9 0 - 11 6	18 6 - 23 6	20 0 - 26 0	20 0 - 24 0
Dec.	Königsberg	34 0 - 39 6	13 0 - 18 0	9 6 - 12 6	17 0 - 23 0	20 0 - 26 0	20 0 - 24 0
Jan.	Königsberg	34 6 - 40 0	12 6 - 16 6	9 0 13 0	16 6 - 23 0	20 0 - 25 6	20 0 - 24 0

Freights from the Baltic from 2s 3d to 2s 6d; from the Mediterranean, from 5s 6d to 6s 0d; and by steamer from Hamburgh, 2s 0d to 2s 6d.

THE REVENUE.—From 5th January 1850 to 5th January 1851.

	Quarters ending Jan. 5. 1850.	Quarters ending Jan. 5. 1851.	Increase.	Decrease.	Years ending Jan. 5. 1850.	Years ending Jan. 5. 1851.	Increase.	Decrease.
	£	£	£	£	£	£	£	£
Customs	4,720,630	4,596,705	.	123,925	18,695,798	18,614,880	..	80,918
Excise	3,625,061	3,715,920	90,8[illegible]9	.	12,753,815	13,003,961	250,146	.
Stamps	1,509,860	1,459,721	..	50,139	6,365,475	6,095,641	..	269,834
Taxes	1,897,961	1,023,053	25,092	..	4,303,849	4,360,178	56,329	..
Post Office	152,000	152,000	.	.	806,000	820,000	14,000	..
Miscellaneous	118,408	80,391	..	38,017	409,242	334,552	..	70,690
Property Tax	449,394	418,730		30,664	5,408,159	5,383,037	..	25,122
Total Income	12,473,314	12,346,520	115,951	242,745	48,742,339	48,616,249	320,475	446,564
		Deduct Increase		115,051		Deduct Increase		320,475
		Decrease on the qr....		126,794		Decrease on the year		126,089

TABLES OF BUTCHER-MEAT.—Per Stone of 14 Pounds.

Date.	London. Beef	London. Mutton	Liverpool. Beef	Liverpool. Mutton	Newcastle. Beef	Newcastle. Mutton	Edinburgh. Beef	Edinburgh. Mutton	Glasgow. Beef	Glasgow. Mutton
1850.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Dec.	5 6 6 9	6 3 - 7 0	4 6 - 6 3	5 0 - 6 6	4 6 - 6 0	4 6 - 6 0	5 0 - 6 3	5 0 - 6 6	5 3 - 6 6	5 6 - 7 0
1851 Jan.	4 9 7 0	4 8 - 7 6	4 9 - 6 6	5 3 - 6 9	4 9 - 6 3	4 9 - 6 3	5 3 - 6 3	5 3 - 6 6	5 3 - 6 9	5 6 - 7 3

PRICES OF ENGLISH AND SCOTCH WOOL.—Per Stone of 14 Pounds.

English.	s. d. s. d.	Scotch.	s. d. s. d.
Merino,	13 0 to 18 0	Leicester Hogg,	11 6 to 16 6
in grease,	9 6 to 14 0	Ewe and Hogg,	9 6 to 14 0
South-Down,	13 6 to 18 0	Cheviot, white,	12 0 to 15 6
Half Bred,	11 0 to 14 0	Laid, washed,	9 9 to 11 6
Leicester Hogg,	11 6 to 17 0	unwashed,	6 6 to 8 6
Ewe and Hogg,	9 6 to 14 6	Moor, white,	6 6 to 8 6
Locks,	6 6 to 9 0	Laid, washed,	5 9 to 7 3
Moor,	5 6 to 7 6	unwashed,	5 3 to 6 6

INDEX.

URGH.